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SURGICAL PRINCIPLES

AND

MINOR SURGERY.

BY J. G. GILCHRIST, M. D.,

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1881.

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1881.

STUDENTS OF MEDICINE,

TO WHOM

THE FUTURE

OF HOMŒOPATHY,

IN CONNECTION WITH THE

CHIRURGIC ART, IS ENTRUSTED. WITH

THE HOPE THAT MY LABORS MAY ASSIST THEM IN

THE PROSECUTION OF THEIR STUDIES,

THIS LITTLE MANUAL IS

DEDICATED AND

INSCRIBED

BY

THE AUTHOR.

PREFACE.

When the last edition of an exceedingly defective book—Surgical Diseases—became exhausted, my publishers supposed that a new and improved one would be well received, and suggested the revision and re-writing of the work. The errors, inaccuracies, and crudities of the old edition, however, were soon found to be so numerous, that it was impossible to use to advantage any portion of the text, or even to follow the arrangement of the original work. As the work progressed, it was made apparent that to include accidents, and purely mechanical treatment of the morbid processes referred to, would greatly increase the size of the volume, and necessitate a very imperfect discussion of highly important conditions. It was decided, therefore, to complete that volume on a pathological and therapeutical plan, as far as the limits would permit, reserving purely traumatic conditions for a separate treatise. Inasmuch as the change in arrangement would leave something elementary and preparatory desirable, the present volume was prepared.

Considering the present volume, then, as the initial volume of a series on surgical topics, a scheme has been arranged with some reference to an ideal collegiate course of instruction, embracing four volumes, at least, if not five. That such a division of topics is not artificial, it is only necessary to consider the scope of each volume, and the demand the age makes upon our schools for medical education.

The *first year* of a student's life finds him without any

knowledge of the scope of medical study, entirely uninformed of the demands to be made upon him, and frequently unfamiliar with the language of the science or the art. The custom so long prevailing of opening the surgical course with the consideration of inflammation, a topic that cannot be understood without a comprehensive knowledge of the physiological processes of waste and repair, and the elements, at least, of surgical pathology, is unwise to a degree. Under the old methods of teaching this seems to be unavoidable, and now that better counsels prevail, and the necessity for medical reform is admitted on all hands, it is proper that the ground be carefully surveyed and an attempt made to inaugurate systematic methods. The first year of pupilage, therefore, in surgical instruction, should be purely elementary, include only such topics as are comparatively free from technicalities, and necessary to a proper understanding of what is to follow. This would include a discussion of the functions, amenities, and responsibilities of the surgeon, the elements of diagnosis and prognosis, the manufacture and application of the various dressings used in surgical practice, and the performance of minor operations, such as require no particular skill or extensive surgical knowledge. These being thoroughly mastered, the student will be prepared to proceed further.

The *second year* will find the student not only well informed in the elements of surgery, but it is supposed that his studies in other departments have taught him the leading facts in physiology, we are enabled to introduce him to a more scientific investigation, and will take up surgical pathology and therapeutics, as foreshadowed in the second volume of the series, *Surgical Therapeutics*. We here discuss the process and termination of inflammation, as well as

the various abnormalities, the method of production of neoplasmata, as well as all conditions not purely traumatic, both of a general and local character.

In the *third year* the foundation is laid for the crowning duties of the surgeon's calling, by a study of traumatism in all of its varying phases, both primary and remote effects, methods and explanation of anæsthesia, and some consideration of the legal responsibility of surgical practitioners and other questions of medical jurisprudence connected with the practice of surgery.

The *fourth year*, the last of student's undergraduate life, is fittingly occupied with instruction in the application of the principles he has hitherto been taught, or operative surgery. The degree of proficiency now attained by the student, will be only limited by his own capacity for receiving, and his teacher for imparting knowledge; as far as mere principles are concerned, there should be little more to acquire, and the training received will admirably fit him to pursue his studies, post-graduate, with profit to himself to a far greater degree than could be attained by any other system or method of teaching.

To supply a text-book for each of these college years, has been my desire; the present volume being intended for the first year; the volume on *Therapeutics*, already before the profession, answering for the second, until a thorough revision can be had; a volume on *Surgical Emergencies*, now in press, for the third; and a volume of *Surgical Operations* will be prepared as a text-book for the last or fourth year.

The present volume will probably show that even in Minor Surgery there is a necessary connection with an enlightened system of therapeutics. There are unquestionably many omissions, particularly of topics that we have been

accustomed to look for in such publications. Fractures and dislocations, and in one instance (SARGENTS) a condensed account of gun-shot wounds has been introduced. The accomplished surgeon knows that none of these topics can be considered of a minor character, and no apology is offered for transfering them to a more suitable volume (*Emergencies*). The reader will note the absence of all allusion to cauteries, as a therapeutic agent, hypodermic injections, blisters, and the like. They have no place in our *armamentum chirurgiæ,* and require no notice at our hands. There will also be observed a material curtailment in the varieties of bandaging; all surgeons will bear witness that many of them are never used in actual practice, and are chiefly retained in some of our text-books as forming "exercises" for the student. I am of the opinion that the "exercising" had better be confined entirely to the necessary methods.

With these explanations I trust that this portion of my labors will meet the approval of my colleagues, and that students will find it a helpful guide to them in the pursuance of their studies. J. G. G.

DETROIT, 1881.

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SURGICAL PRINCIPLES

AND

MINOR SURGERY.

INTRODUCTION.

In the outset of the study of any science, it is essential that the student should have a correct knowledge of the terms and nomenclature; very often as a pre-requisite to success. Perhaps in the case of surgery the above may be modified, as the principles and practice of the art are continually undergoing changes, additions, and expurgations; in fact the whole subject, like many others in medical literature, while based upon fixed scientific principles, contains much that cannot, from its very nature, be considered truly scientific. Nevertheless, the boundaries of our study, and a correct understanding of our duties and prerogatives, can only be attained by a rational conception of the peculiar and distinctive technology. We may ask, then, in the very outset, what does "surgery" itself mean? Unquestionably, if we confine ourselves strictly to the etymology of the word, we would imbibe a false conception of the duties of the surgeon. As in anatomy, we find many words, which, having a definite etymology, in the course of time have been retained simply for convenience, and to avoid the confusion that would arise from frequent changes, we find

that almost the whole field of medical study is filled with similar modifications from the original use. If a strict enforcement of the original principles were demanded, and professional men compelled to use words with the primary significance, our text-books would all need rewriting. Materia Medica, for instance, would then embrace a consideration of all the appliances, remedies, and agents of any kind used in the treatment of the sick, as well as those required in case of accident, and indeed all the exigencies of medical life, even to the instruments of the surgeon, and obstetrician. Happily, the lines are not as strictly drawn, and we find many words used in a conventional as well as a literal sense, and some of them requiring frequent changes in interpretation, as advancement in the sciences of medicine demands.

Surgery, therefore, while a corruption from *chirurgy*, meaning to work by hand, or referring to a mere handicraft, has gradually emancipated itself from the thraldom of a mechanic art, and taken its place among the sciences as one demanding the highest social, personal, and professional characteristics, graces, and qualifications. It may truly be considered the consummation of medical science, as it reaches out, more or less, into every department into which modern research has been compelled to divide the field of medicine. The old significance of the word can no longer be retained, and we are compelled to use it, for convenience, with a widely different meaning. None of the definitions I have seen sufficiently express the actual province of the surgeon, and I have been accustomed to give my classes an original one, which may now have lost, to some extent, its individuality

SURGERY is that department in medicine which treats of morbid processes chiefly characterized by objective phenomena, as well as all those which demand mechanical or instru-

mental treatment. The practice also includes cases of accident, and deformities, that result therefrom, that are congenital, or the sequelæ of disease.

Even this somewhat comprehensive definition will shortly require modification, as "objective phenomena" includes not only symptoms visible to the surgeon through the medium of sight, but that can be interrogated and observed, without the aid of the patient, by means of the stethoscope, rhinoscope, ophthalmoscope, endoscope, and the various speculæ, or any of the modern diagnostic appliances. The above will serve very well to assure the student, that with a desire to master this noble and ancient science, he will undertake no light task. His best energies will be demanded, and unremitting study and application is the price to be paid for the acquisition of its stores of wealth.

It is proper, therefore, to next consider the *qualifications of the surgeon.* GUY DE CHAULIAC speaks as follows: "He, the surgeon, should be courteous and condescending, bold in security, cautious in time of danger, avoiding impracticabilities, compassionate to the infirm, benevolent to his associates, circumspect in his prognostication, chaste, sober, pious, and merciful; not greedy of gain, no extortioner, but looking to his fee in moderation, according to the extent of his services, the ability of his patient, the result of his treatment, and a proper sense of his own dignity."

The accomplished surgeon should, as a first and vital qualification, possess an accurate *knowledge of anatomy*, both surgical and general. Without this it would be an utter impossibility to perfectly understand the nature of lesions presented to him for treatment, or to intelligently undertake the performance of any of the major operations. It will not only be necessary that he make frequent dissections, but that in

all cases requiring operations involving the great cavities, or in a region in which important vessels or nerves are situated, special dissection should be made of the part under consideration. There are very many cases, unquestionably, which from their urgency will not permit such a preparation, from want of time, and this is an additional reason why frequent general dissections should be made. It will not be sufficient to confine our studies of anatomy to the dead subject. None but experienced surgeons know the difficulty that exists, in certain cases, in distinguishing with certainty the difference between an artery, nerve or tendon. Under favorable circumstances one may well be mistaken for another, and unless the observer is very familiar with the anatony of the part, and the peculiar appearance of different tissues during life, mortifying mistakes may occur. In fact I know of a case in which the tendon of the biceps brachialis was tied for the brachial artery; strange as such a mistake may seem, it actually occurred. To become familiar with the appearance of different parts, the surgeon should take every opportunity to witness operations. The principles of operative surgery having once been acquired, an ordinary amount of practice will keep them in mind, and no one who desires to distintinguish himself in the practice of surgery, should fail to keep himself well informed in anatomy. There are those, who from mental peculiarity, are unable to retain names and terms with facility, but are perfectly at home in a knowledge of the structure of anatomical regions, and can see in their minds eye, a topographical map on looking at a part. The faculty is valuable, but must not be allowed to be cultivated at the expense of more complete knowledge; it is important to remember the *names* as well as the location. While all departments of anatomy should be well studied, if circum-

stances demand a neglect of some of them, particular attention should be paid to the distribution of the arteries and nerves.

The surgeon should, also be possessed of *courage and* intrepidity. By this I do not mean courage to attempt useless and hazardous operations, but to meet with coolness and fortitude the occasional accidents that occur in actual practice, and to perform dangerous operations when the occasion demands. It has been said that fear of hæmorrhage deters many from attempting operative surgery, and none better know how true this is than those of large experience. The mere fact of arterial hæmorrhage is not so embarassing, as the conviction that the sources of the flow are not fully understood; and that if ligation of the main trunk is demanded one does not feel sure that he can locate it, or even determine what the main trunk is. For instance, one of the facial arteries being wounded, and ligature in the wound not proving effective, the young surgeon may not be able to determine whether the external, internal, or common carotid must be tied, either through defective anatomical knowledge, or from his loss of self-control. The good surgeon is never startled by sudden hæmorrhage, as he is either expecting it, or if deceived by an anomalous distribution, is conscious of his ability to control it. Then again, nothing but long experience can enable the operator to estimate the degree of danger in a given case; what would be a fatal bleeding to one, would be trifling in another. A knowledge should be had of the amount of hæmorrhage to be expected in certain cases, and its source. All these circumstances serve to embarass and appall the novice, and demand courage, based upon knowledge and experience, to meet with the composure so characteristic of the good surgeon.

The surgeon should have some considerable *mechanical ingenuity*, with a fair knowledge of the primary principles of mechanics. Divorced from a thorough professional teaching, mechanical knowledge alone would frequently lead the possessor astray, as he is liable to lose sight of the fact that he has a living being and not a mere machine to exercise his ingenuity upon. For instance, a fractured bone may be readjusted, and the fragments held in firm opposition by the application of proper mechanical appliances, which would suggest themselves to an artisan on purely mechanical principles. The scientist, however, will be forced to take into the account the fact that the living tissues may be devitalized and destroyed by severe compression, and muscles permanently ruined by attention to mechanics alone. Many emergencies arise that demand the exercise of much mechanical knowledge and skill, in which ordinary apparatus cannot be procured, or from some peculiarity in the patient, the part injured, or the nature of the injury, cannot be employed. The qualities under consideration are likewise necessary to enable the surgeon to comprehend the uses and construction of complicated instruments, as well to furnish ease in their use, and ability to repair slight injuries or derangements that may occur when either distance from a cutler or immediate necessity for use forbids delay. In many different ways such skill and ingenuity will be needed, many instances of which will readily occur to the reader.

Allied very closely to the above qualification, a *familiarity with instruments* must be cultivated. Nothing can give this but frequent use, and in the absence of daily surgical occupation, dissection must be sedulously practiced. It is true, as will be shown in another place, that while the edge of the knife is directed to the skin in dissection, in operations on the living

subject this is reversed; still the operator becomes accustomed to his instruments, acquires useful knowedge of the amount and degree of resistance offered by different tissues, and is continually receiving useful information in anatomical relations. While all successful surgeons have more or less facility in the use of instruments, some from natural aptitude, none can afford to neglect opportunities to further perfect themselves.

Pathological knowledge, joined to an intelligent conception of etiology, is absolutely *sine qua non*. The ground covered to-day by surgical pathology, including as it does a consideration of the most subtle forces and minute vital operations, makes it an impossibility for the surgeon to freely and intelligently weigh the indications for treatment without an intimate acquaintance with the natural history of the morbid process under immediate consideration. This question has been fully discussed in the *Introduction* to *Surgical Therapeutics*, and needs no further mention at this time. Not only treatment, but prognosis is entirely dependent upon our knowledge of the case in hand.

Materia Medica, as understood by the Homœopath, must be well studied. There is nothing that the general practitioner should know in this direction, that should be unknown to the surgeon. Unfortunately, too many of our surgical practitioners are deficient in this important particular, and the pages of our text-books are too often marred by suggestions as to treatment not a whit superior to the methods in vogue half a century ago. The examination of a case of disease, purely surgical, must be made with a view to relief by medicinal agents, reserving the use of the knife as a last resort.

Physiology and *physiological chemistry* should also be

understood of course thoroughly, but at all events the leading principles. How can a practitioner undertake the treatment of urinary calculi without understanding the manner of their formation, and the morbid action resulting in lithiasis? A simple removal of the formed stone will rarely cure, unless it is due to local causes from foreign material, and even then it is not everyone that can conclusively determine whether that is the case or not.

Microscopy is an accomplishment that is closely allied to the last. It is not absolutely necessary that the surgeon should be an *expert*, for that would require constant application, and the consumption of time that can illy be spared from other studies. He should, however, know enough of the science to enable him to differentiate between normal and abnormal tissue, and the more common and constant urinary salts and deposits. Even if his diagnosis must be confirmed by reference to plates, etc., he should be familiar with the mechanical part of the subject, and enabled to use the microscope intelligently.

Added to these qualifications, many of which are purely professional, there are still other requisites, of a mere personal and general character.

He should be *courteous* and gentlemanly, treating his patients in a sympathetic and kind manner. Such practice will inspire confidence, and when we recall how many cases are brought to us from a distance, many of them having been sufferers for years, and the effect of removal from home and home comforts and sympathies, being surrounded by strangers, and expecting a passage through a trying and painful ordeal, must have, we are ready to admit, that harsh treatment, cold attention to the history of the case, and an unfeeling manner will have a deleterious influence, and may not only

retard or jeopardize recovery, but may seriously affect the professional success of the offender. Courtesy and a gentlemanly bearing will not only inspire confidence in the skill of the surgeon, but will calm the fears of the patient, and exercise considerable influence on the result of treatment in the case of the weak and nervous.

Finally, the surgeon should be *cleanly in his person* and habits. It is not meant that he should be foppish, and pay much attention to dress, as that leads many to suspect an ill-regulated mind. He must be cleanly as much to avoid repelling the confidence of the patient, as to guard against conveying infection to him. Too many melancholy instances are on record of infection being carried from one to another, mediately, to excuse carelessness in this respect. Not only must the *person* be clean, but all instruments, whether for operation or diagnosis, must be scrupulously cleansed, and never used twice in succession without undergoing a thorough cleaning. Syphilis, pyæmia, gonorrhœa, erysipelas, etc., have often been communicated by a failure to observe these requirements. Important as this is in the case of all practitioners, it is particularly so in the case of hospital surgeons, who frequently operate upon and examine many patients in succession.

What has been said will amply suffice to make good the statement, occurring earlier, that surgery is the consummation of medicine. It is exceedingly difficult to conceive of any variety of knowledge essential to the general medical practitioner, that does not enter more or less into the requirements of the surgeon. The better physician he is, the better surgeon, as a rule.

In conclusion let us briefly consider the relations the surgeon should sustain to the physician. For many years the

conviction has been gradually forced upon the medical profession, that a division into specialties, within reasonable limit, is an absolute necessity. There are none, no matter how gifted by nature, that can hope to acquire an exhaustive knowledge of medicine. Even surgery has been divided into at least three departments, and perhaps four. Ophthalmology, gynæcology, and orthopedics, are now made distinct departments of surgical practice, and surgical practitioners quite generally concede the necessity for such an arrangement. The necessity being admitted, it becomes the positive duty of the profession to do their utmost to secure the services of those confessedly skilled in the various departments, for their patients who need such special treatment. This is not more for the personal and pecuniary benefit of the special practitioners, than that of the profession at large, and the public as well. It should be the aim of the medical man to contribute not only to the welfare of his immediate client, but to society as well, by fostering everything that is calculated to mitigate suffering, lessen mortality, and prolong life and usefulness. With this enlarged view of the nature of our ministrations, the physician who, for purpose of gain, or jealousy of his colleagues, or a contemptible desire to appear a prodigy in the eyes of his patrons, continues to treat a condition with which he is unfamiliar, when accomplished specialists are available, is unworthy of patronage, or even of professional fellowship. The accumulation of skill and knowledge is directly dependant upon practical experience, and the benefits to the profession, and to society at large, can only be secured by fostering this by the encouragement of those engaged in special practice. What would we have known of physiology without the labors of Sequard, Dalton, Flint, and others? Of

microscopy, without Frey, Beale, etc.? Of surgery, without Billroth, Lister, and Syme, and their many colaborers? And what would their skill have availed had their brethren withheld from them a hearty support? Whilst they themselves, as is right, have been benefitted in a pecuniary way, how much more has the whole profession and the world at large derived benefit. It should be constantly impressed upon the minds of students, and medical men generally, that to encourage special study and special practice, is a positive obligation which none can be suffered to disregard. The accomplished surgeon, as that is the specialty in hand, has a right to expect the cordial support of his non-surgical colleagues, and they who withhold it from him should suffer in the public estimation, for the commission of what might almost be considered a criminal act, inasmuch as they have lessened, as far as they could, an opportunity for adding to the sum of human knowledge, and so far added to the aggregate of human suffering.

I can do no better, in closing this introductory, than to quote from one of the greatest living surgeons, and the paragraph should stand as a constant expression of obligation on the part of all true, earnest, scientific medical men:

GROSS, (*System of Surgery*, I., p. 503,) says: "The after-treatment should always, if possible, be superintended by the surgeon himself; his duty is not over with the operation: it ceases only with the cure or death of his patient. 'The practice' remarks an eminent authority, 'of performing a serious operation, and leaving the after treatment to others, has, in my knowlege, repeatedly proved disastrous. The medical treatment, a duty not less responsible than the operation, belongs to the surgeon; and, indeed, to be merely employed as a handicraftsman, conveys an imputation at which the dignity of a scientific mind revolts."

I can add to this, that the physician calling in the surgeon, should always be associated in the treatment, but my own experience has compelled me to imperatively decline to perform an operation under circumstances that forbids my supervision, at least, of the after treatment. It is only lately that an operation was successfully performed, and the patient left in a fair way to recovery, but the inexperience of the attending physician, and his criminal vanity which prevented his reporting the progress of the case to me, led to a disastrous termination. The loss of reputation, in this case, did not attach to the incompetent physician, but to the surgeon, which was partly merited, indeed, by his inexcusable folly.

Part First.

SURGICAL DIAGNOSIS AND SEMIOLOGY.

Cases of accident or disease, coming under the notice of the surgeon, must be subjected to a critical and comparative examination, based upon the history, or anamnesis as it is otherwise called—the nature of the accident, the sex, age, and social condition of the sufferer, and the symptoms. In other words, it is essential that some theory of the case be formed before methods of treatment can be selected, or a prognosis given. This is technically known as *diagnosis*, derived from two Greek words signifying "I know." It can be at once seen that the diagnostic ability of the practitioner is in direct proportion to his scientific knowledge and practical experience, which fact would lead many to place this chapter at the close of a treatise on surgery, rather than the beginning. It is true that a complete treatise on diagnosis would include the whole natural history of disease, and that the limits of a single chapter would be far too restricted to adequately present the subject. Nevertheless, there are certain general principles that underlie what might almost be called a science, that it seems to need attention at the beginning of our studies, and cannot, it is believed be neglected; nor can they find a more appropriate position than in the first chapter of a work on surgery. It is important that the student and young practitioner should know the best and

most rational method of examining his patient, and how to reach a scientific conclusion systematically. Some there are who instinctively grasp the whole situation on simply looking at a patient, or at most by what would seem, to those less gifted, a very superficial examination. Others, even with large experience, can only reach the same result by a process more or less laborious. The last needs a systematic method, at once to shorten his labors and to increase his accuracy; and the former should practice similar methods to confirm his first impressions, and to guard himself against mortification that may arise from too hasty conclusions.

There can be no question that in surgical matters, whatever may be said of general practice—accurate diagnosis is of the very first importance. No matter what the operator's skill may be, or the profound knowledge of therapeutics possessed by the surgeon, a mistake in diagnosis may result in the death of his patient, or expose him to annoyance, and loss of professional reputation and prestige by a suit at law. What can atone for the puncture of an aneurism for abscess or hernia; or destruction of the hip by mistaking fracture for dislocation? There are occasions when little opportunity is given for careful examination, the emergency demanding an instantaneous application of some means of cure or relief; the conclusion is reached instinctively, it is true, but it is an instinct due to experience and knowledge. Thus when a patient is bleeding to death from a severed artery, a ligature must be at once applied, and neither is there time or necessity for prolonged examination. So also in practice in large hospitals; the attendant cannot give the requisite time for analytical and systematic examination, and yet such examination as the accomplished surgeon would make, would almost unconsciously be conducted in the order to be laid down

shortly. He is not conscious of noting age, sex, position, expression of countenance, etc., but nevertheless, all these matters do receive appropriate attention. Here we have an illustration of the value of systematic training, enabling the man of experience to do intuitively, what might be a laborious mental process to another. At all events habits of orderly and systematic examination must be cultivated, and in all cases in which opportunity of time and circumstances permits, neglect nothing to arrive at a positive conclusion.

A complete knowledge of a given case is to be obtained by the consideration of three elements, each of which will be noticed separately:

1. Diagnosis, including { (a.) History. (b.) Semiology. { Subjective symptoms. Objective symptoms.
2. Etiology, including { (a.) Predisposing causes. (b.) Exciting causes.
3. Prognosis, as to { (a.) Continuance of life. (b.) Continuance of function. (c.) Preservation of symmetry. (d.) Duration of attack or case.

1. Diagnosis. — Errors in diagnosis are of very frequent occurrence; inexperience undoubtedly will be the cause in the great majority of instances, and yet there are very few who cannot recall more than one mortifying occurrence, even when enjoying large experience. Haste in examination, as said earlier, wilful or unintentional misrepresentation by the patient, friends, or bystanders, insufficient light, and a host of equally embarrassing circumstances may arise, but in very many instances the fault will rest entirely with the surgeon. In all cases where time can be spared, the notes of the case should be committed to writing, thus insuring an avoidance of losing sight of important features and considerations, preserving what may be valuable data for future use, and cultivating habits of order and method.

The examination may be conducted in one of two ways, synthetical or analytical, or, as it is called, "exclusion." In the first method, we start without theory, and construct one as the symptoms elicited suggest. In the second, we at once recognize a group of phenomena as indicating a number of somewhat analogous conditions, and as the examination progresses, strike out one after another, as the symptoms reached contra-indicate. For example, under the *first method*, suppose a patient is presented with a tumor on the head. Without attempting a classification, one theory or another will prevail as the symptoms are elicited, a final determination being reached only with the conclusion of the examination, during which there must be much confusion of mind as conflicting indications are brought out. Under the *second method*, we will at once say, here we have either atheroma, fungus of the cranium, fungus of the dura mater, or hernia cerebri. It is found on tactile examination that the growth cannot be pressed back into the skull, and no opening can be found in the vault; at once we exclude hernia cerebri and fungus of the dura mater. Two conditions now remain. We find the tumor is unattached at the base and can be freely moved. Fungus of the cranium is then excluded, leaving atheroma alone. There can be no question that this is the better method, as we save time, have definite objects to attain, and have a naturally systematic course suggested. We will, therefore, conclude that the practice should be on the method of exclusion or analysis.

We have seen that diagnosis rests upon two elements, viz.: *anamnesis* and *semiology*, the latter being divided into two groups of symptoms, the *objective* and *subjective*. Let us take them up in order, and suggest the ground to be covered, with examples:

(a.) *Anamnesis* is a word derived from the Greek, signifying "again, to put in mind," or to recall to memory, and is used to indicate previous history. The points to receive attention may be, previous diseases; hereditary condition; habits; occupation; age; sex; social condition; duration of present attack; how injured, if a case of accident; and the course of the disease up to the present time.

Previous diseases must always be questioned, when the conditions are chronic. Thus it is well known that without a history of syphilis, mercurialization, or abuse of iodide of potassium, many intractable eruptions, subcutaneous swellings, or ulceration, could never be understood. The removal of a tumor, six months or more previously, might at once account for the malignancy of an ulcer. Slowly increasing swellings in glandular regions, if a history of similar troubles with chronic suppuration is elicited, will be at once set down as struma, and all ideas of tumor formation be dispelled. The sudden disappearance of chronic eruptions may account for functional disturbances, and the like. In fact nearly all chronic conditions may well suggest some previous morbid action, of an apparently different character, and a diagnosis cannot be made if the existence of such action is not brought out.

Hereditary diseases, such as syphilis, struma, phthisis, and carcinoma, will often be so much modified by circumstances, that an accurate diagnosis cannot be made without the knowledge that the patient's ancestors have suffered in a similar manner. Even the failure to recuperate from injuries may frequently be referred to conditions transmitted from father to son. Many observers are of the opinion that the physical peculiarities are inherited from the father,

and the mental and emotional from the mother. We would expect, therefore, to find cancer, etc., transmitted from the father alone, but such is not the case. If my theory of carcinoma, (*vide Surgical Therapeutics*,) is correct, the rule would still hold good, as in the mental sphere, the first step towards cancer is made, and the characteristics of this sphere, we are told, are eminently maternal. A tumor of doubtful character, a cutaneous eruption, or a defect in ossification, can be readily understood when we learn that the immediate progenitors of the patient had cancer, syphilis, or struma.

The *habits* of the patient should never be neglected. Prostitution would lead one to refer genito-urinary lesions to syphilis or gonorrhœa; masturbation would account for some abnormality in the genital apparatus, or some mental defect; drunkenness would account for, or suggest unusual prophylaxis, in erysipelas, etc. Sedentary pursuits would clear up confusion as to the nature of obscure rectal or anal tumors. In many different ways the habits of a patient, in a state of health, or prior to the *status præsens*, would clear up a doubtful diagnosis.

Occupation is naturally connected with the preceding. Tumors of doubtful character about the knees, are at once recognized as bursal enlargements, when we learn that the patient is a housemaid, or tailor, or shoemaker, as these parts are, in such occupations, subjected to unusual irritation. Similar conditions about the hip, or elbows, will be recognized as bursal when the patient is a minor. Necrosis of the bones of the face, will not be referred to mercury or syphilis, when we learn that the patient works in a match factory, or has anything to do with phosphorus. At one time a peculiar ulcer on the joints of the fingers annoyed me in some cases where no adequate cause could be learned; but

the cause was ultimately found to be oxalic acid used in trunk-making.

Age is of the first importance in very many surgical conditions. We know that the bones exhibit a preponderance of inorganic elements in the aged, and that they are consequently more brittle; we also know that the angle of the jaw is changed in age, and also the direction of the femoral neck to the shaft. Hence in doubtful cases, fracture of the neck of these bones will be diagnosed in place of dislocation, when the signs are obscure—or in cases of impaction. So also in ulcerated conditions about the mouth. In the young we would suspect cancrum oris, in the old lupus or epithelioma. Tumors in general are known to be more malignant in the old, increasing in malignancy with the age of the sufferer.

Sex, while not as valuable an indication, in morbid action of a general character, is often of the first importance in leading to a correct diagnosis. Thus tumors about the neck, which might cause confusion, in the case of males, will frequently be found goitre in women, as they are more liable to such troubles. Abdominal tumors, particularly, cannot be accurately determined without considering the sex. The prevalence of hysteria in women, although not a few of the sterner sex have suffered from it—modifies and changes, or throws doubt over many a diagnosis. Age and sex may both be useful in some forms of coxalgia; occuring in adult life, in women, painful when walking and thinking of it, being kept *awake by the pain but never being wakened by it*, will serve to exclude hip-disease from consideration.

Social condition, whether married or single; rich or poor; happy or discontented, is a very prominent element in diagnosis. Abdominal enlargements, in married women, will

always suggest a possibility of pregnancy, while without a suspicion of chastity, it would not enter into the case when the patient is unmarried. So with uterine hæmorrhages, whether due to abortion, or metrorrhagia, would inmany cases depend upon marriage or not. The rich and luxurious, might be expected to suffer from post perfection of the blood, and gout and synochal inflammations occur; while the poor, ill-fed, housed, and clothed, would suffer from inflammation of an asthenic character, due to impoverishment of the blood. Stimulation *might* be demanded in one case, and depletion in the other; at all events the habits of life would require changing in both instances, either to facilitate recovery, or to place the patient in a favorable condition for an operation.

The *duration* of an attack is often important in determining the true condition. For instance, a swelling appears in the inguinal region. It is likely to be hernia, if produced rapidly, and abscess when the reverse. Swellings in other regions, may be aneurismal when suddenly formed, abscess or tumor when of slower development. Ulcers in the genitals when of long existance may be set down as chancroid, when shorter chancre may be the condition.

The *nature of the accident*, when being examined for injury—is manifestly of prime importance. A severe blow might cause suspicion of fracture, while a twist or wrench, would suggest dislocation. Falls on the head, with unconciousness, compression or concussion; while the same condition from blows in the precordia, or excessive hæmorrhage, would suggest syncope; immersion in water, exposure to noxious gasses, etc., with similar loss of consciousness, would show asphyxia.

Finally, the *course of the disease*, would be of the utmost

importance to observe. Thus paralysis gradually following hyperæthesia, or anæsthesia, would direct attention to the spine or encephalon. Coming on at once after trauma, we would look for nerve lesions in their continuity. The regular appearance of iritis, ulceration in the fauces, and roseola on the trunk, would direct attention to syphilis. A sudden swelling in the groin, with nausea and vomiting succeeding violent pain, would show hernia.

As will appear later however, discretion must be exercised in taking the history, and any inducement that might exist to mislead or falsify carefully weighed. Young women will attempt to conceal loss of chastity; married women abortion; men will deny exposure to syphilis or gonnorrhœa. Hence any want of harmony in the account given by the patient or friends, or the existence of causes for deception, must demand great care, and the exercise of sound judgment, carefully weighing all the probabilities before concluding a diagnosis.

(*b.*) *Semiology*, is likewise derived from two Greek works, meaning "a sign" and "discourse," and is that department which refers to a knowledge or discussion of the symptoms of disease. We have two classes or sets of symptoms, each of which must receive careful attention, but in surgical practice, and when there is a manifest want of harmony between the relation of the patient and what can be observed by the surgeon, the latter should always take precedence. The former are technically known as *subjective* symptoms; the latter *objective.*

Subjective symptoms, as already said, are those sensations, experienced by the patient, that cannot be observed by the surgeon, who is compelled to rely upon the statements made to him, and exercise his powers of discrimination and know-

ledge of morbid action to determine upon their reliability. In surgical practice it has always been the rule to accept these statements with a good deal of allowance, and credit nothing that is not well borne out by what is visible to the senses. There are so many circumstances which have a tendency to detract from their value, that it is well considered a misfortune that medical practitioners are compelled to rely upon such statements so largely, and the ingenuity of the profession is largely engaged in devising new and improving old diagnostic appliances, which necessitate less reliance on these truly blind guides. An intelligent hypochondriac or hysterical sufferer, can entertain his attendant by the hour with a recital of distressing and formidable symptoms, and in the abscence of the stethoscope, and similar aids to diagnosis, false impressions are almost unavoidable. There are so many inducements, at least in the experience of the surgeon, to falsify, magnify, or distort, either for the purpose of extorting sympathy, or even less worthy motives, that nothing should be accepted as a fact, until either it has proved so, or is incapable of positive interrogation. At this time it can only be necessary to suggest a method of examination in general, particulars being almost impossible.

The Hahnemannian injunction has stood the test of experience, and nothing has been offered since his day that promises any better. In cases when time can be devoted to it, the patient should be requested to tell his or her story, without unnecessary interruption, or above all, the interposition of leading questions, or that would suggest certain answers; particularly must we avoid categorical questions. When the recital is finished, questions may be asked, still guardedly, in chronic cases, when seeking for a remedy, begining with the head, and following the well known anatomical order of

the older works on Materia Medica. Each region is to be examined, as laid down in the next section, as we proceed, and everything in the subjective group that does not correspond with the results of this examination must be excluded.

In cases in which the sufferings are chiefly confined to one region or organ, there is no necessity for this extended examination, that is for purposes of diagnosis; the remedy, however, can only be scientifically selected by securing the *totality* of the symptoms. Now by "totality of the symptoms" the intelligent practitioner does not mean simply all that the patient has to tell; but, on the contrary, all that can be observed with the aid of the thermometer, test tube microscope, etc., added to the former. Thus we find that there are two purposes in the examination. First, to determine the morbidaction, the etiology, and prognosis. Second, to select a remedy or determine upon a line of treatment to be pursued. To a certain extent both objects are attained simultaneously, but after the first is satisfactorily accomplished, the second demands a considerable prolongation of the process.

Objective symptoms, from their very nature, are of the first importance to the surgeon, and are only less so to the physician because he has so few presented to him. They are all such symptoms, changes, and conditions as are visible to the eye, or can be brought into view with the various speculæ and other diagnostic appliances, as well as all those that his senses, touch, etc., can observe without any aid from the patient. In this sense the *bruit* of aneurism, as heard through the stethoscope, is as much an objective sign, as an ulcer on the surface; the crepitus of fracture, equally with deformity when the fragments are displaced. A few examples are given below, as well to illustrate our meaning as to suggest a method of examination.

Posture is a very important diagnostic sign, and should always be observed, particularly in acute attacks, or cases of accident, as well calculated to direct the attention to the seat of the lesion. Thus,

Supine, indicates profound prostration and serious injury. MEIGS astonished his hospital class by confidently asserting that a certain patient, at the farther end of a long ward, would be found better when they reached his bed. His opinion was based upon observing that he had changed his position from a dorsal decubitus, and was lying on his side. The event proved his correctness.

Bent forward, indicates abdominal lesion. It is the usual position instinctively assumed in colic.

Bent backwards, shows spinal lesion, and is the common position assumed in spinal irritations, particularly in tetanus and some of the more serious neuroses.

Paraplegia, or complete paralysis on both sides, indicates spinal trouble, or injury to the large nerve trunks of the extremities.

Hemiplegia, or one-sided paralysis, shows cerebral lesion, and on the opposite side of the brain to the paralized side.

Rigidity of limbs, spasmodic conditions; when but one limb or joint, either spasm or dislocation.

Much can also be learned from the physignomy. Thus: A pointed, pinched expression, usually suggests peritonitis.

Frowning, with the eyes closed, or partially shut, is a common indication of cerebral trouble, particularly cephalalgia.

Compression of the mouth, with a slightly stooping posture, is indicative of pelvic lesion, particularly vesical.

Expanded nostrils, with partially closed mouth and nasal respiration, shows some thoracic trouble.

Such symptoms of disease or accident are usually observed at a glance, and in urgent cases much time may be saved by having some indication of the seat of the trouble. At other times, or after temporary relief has been afforded, the examination may proceed more thoroughly, and would embrace, in most instances, a consideration of one of the following, if not all of them, in cases of chronic and obscure diseases.

Alterations in Form.—The deformity resulting from fracture, with displacement, of the shaft of the long bones, or from complete dislocation, must necessarily be a highly important diagnostic feature; so also the regular pyriform shape of hydrocele, as compared with the spherical form of scrotal hernia. The system is one of comparison, comparing the member or part under consideration with its fellow on the opposite side, or, when there is no corresponding part, with morbid processes or lesions that would induce similar appearances.

Alterations in Color.—In many instances the changed color in a part will furnish alone a reliable theory of the condition. Thus the brown, leathery integument, of scirrhus tumors; the redness of inflammation, or the modification of color produced by the injection of the red blood into a part of some decided tint, as the purple tinge, in the case of a blue iris. The black or livid appearance of gangrened parts may occasionally closely resemble ecchymosis, but other symptoms, as temperature, crepitation, and odor, will assist to differentiate; as a rule, the gradual extension of the color in gangrene, and the recession in ecchymosis will be valuable guides.

Alterations in Temperature.—The clinical thermometer has proved of immense value to the surgeon, and the indications are that when fully developed, and more generally used, the

whole subject of both diagnosis and prognosis will be greatly advanced and rendered more certain. In differentiating between ecchymosis and some forms of gangrene, we find the slight elevation of vital heat in the former, and lowering in the latter, is a feature that renders the diagnosis very much more certain. At present, however, with the great mass of practitioners, this little instrument is of more value as a guide to prognosis, indicating, as it does, vital changes long before any material observable change occurs in the general symptoms.

Alterations in Volume.—A part, or organ, taking on an increased size, it is often of the first importance to decide whether we have a simple hypertrophy, or a tumor to deal with. The regularity of the outline, extent of tissue involved, degree of irritability, probable etiology, and other points must receive due attention, as well as the nature of the part implicated. Thus a glandular enlargement would be attributed to hypertrophy, unless it was partial, while an enlargement of tumor form, in non-glandular regions, would be considered a tumor, unless some other circumstances should occur to modify it.

Alterations in Transparency.—In the case of scrotal changes, this is an important indication. Thus an enlargement of the scrotum, soft and fluctuating more or less, indicates effusion, but whether blood or serum, can only be told by testing the transparency; it would be opaque in the former instance and translucent in the latter. So with some forms of cysts, as ranula, or many of the large serous cysts, they can only be distinguished from polyps or myeloid growths by a test of their transparency.

Alteration in Consistency.—The stony hardness of scirrhus, and the compressibility of fatty or ordinary non-malignant

growths, is a diagnostic feature of the first importance. So also the doughy feeling of œdema, and the elastic crepitating sensation in emphysema.

Alteration in Relations.—The observation of changes of relation, one part with another, must obviously greatly assist in determining the condition. Thus the prominence of one acromial process, and a depression below it, would at once suggest dislocation of the humerus or fracture. So also in muscular ruptures, and fractures with displacement.

Alterations in Mobility.—The preternatural rigidity of a joint, or limb, with full consciousness, and absence of muscular rigidity, coming on suddenly after an accident, and observed within the space of a few hours, would at once direct attention to a luxation; while unusual mobility, with a greater range of motion, under the same circumstances, would indicate fracture in the immediate neighborhood of a joint. Rigidity of a part, of long standing, developing slow, and without noticeable deformity, would indicate anchylosis, unless there was much distortion of the part, when muscular contractions would be more probable.

Alterations in Pulsation.—In many diseases of the arteries, as well as in the case of abscesses and tumors in the neighborhood of blood vessels, it is of the first importance to observe and correctly interpret any change in pulsatien, whether in form or rhythm. Thus the sudden cessation of arterial pulsation in a part, with a state of turgescence above, with a well defined painful spot, would suggest embolism. A greatly augmented arterial action, with some enlargement at one or more points in the part, with a subsidence of the abnormal action, on pressure on the artery, below the point of compression, and increased turgescence above, will at once point to aneurism. So a suspicious swelling over an

artery, which ceases to pulsate on gently drawing it in a direction away from the vessel, will be set down as non-aneurismal at least, its actual nature being determined by other examination.

Alterations in Sound.—The dullness, on percussion of the chest, being in marked contrast to the resonance in other locations will indicate solidification from some cause; so the numerous changes in the cardiac action, valvular sounds, and so on, are of the first importance in thoracic and cardiac diseases. The peculiar blowing, whistling, or *bruit* of aneurism, will be found unlike anything else, and are considered confirmatory in that condition. The sound or tone of the voice, also, will often point to some laryngeal or faucial lesion. In very many ways such changes will be of the utmost diagnostic value.

Alterations in Smell.—The cadaveric of gangrene, the change in the odor of pus, the urinous smell in cases of uræmic poisoning, and the sweetish odor of the perspiration in pyæmia, are all valuable examples of the necessity for paying attention to this point.

The *elicitation of crepitus*, will often serve to differentiate between fracture and dislocation, as well as to distinguish a serous effusion from a purulent.

The *elicitation of fluctuation*, in suspicious swellings, will point to effusion of some kind, either pus, blood, or serum, and while of the first importance, in appropriate cases, can only be considered one element in the range of indications; to determine the character of the effusion, requiring other and different tests.

While what has been written above is of the highest importance in a systematic examination for disease or accident, there are very many other points that must not be neglected. Among the more important are the following:

The *nervous system* must be examined, to determine alterations in nerve action; the sensibility of the integument, whether increased or diminished; the condition of voluntary function; as well as alterations in any of the special senses. Paralysis, spinal lesions, brain-lesions, as well as local nerve injuries, can only be accurately understood by inquiring into the action of the nerves. In many cases the use of the electric battery, the æsthesiometer, and other appliances will be needed to determine nice shades of difference. In no other class of cases will the practitioner meet with so much embarassment, as in the detection of nerve lesions, hysteria, and hypochondriasis simulating them so perfectly.

Pain, it would seem, would always be positive evidence of the existence of some lesion. But the *degree* can never be accurately determined, some highly sensitive persons giving way completely to an amount of pain that would be considered trifling in another of more heroic qualities. Throbbing pains usually indicate suppuration; shooting or lancinating, nerve lesions; a smarting or burning excoriation, etc., but as a symptom, it is of little value. It will be seen in *Inflammation* (*Surg. Therap.*) that increased functional activity may often be considered equivalent to pain.

The *organs of special sense* must always be interrogated in profound vital disturbances. In many instances we may expect to find the earliest indication of approaching disease in this way. Thus the ophthalmoscope will often furnish the first symptoms of diabetis, albumenuria, or cerebral lesion. Alterations in hearing, or some abnormality in the auditory apparatus, often purely functional, will occasionally direct attention to the fauces.

Respiration will be affected in accidents about the neck or chest, as in dislocations or fracture of the hyoid bone;

fracture of the ribs; foreign bodies in the throat or chest; effusions into the pleura or pericardium. A sticking pain on inspiration, at one point, with short gasping respiration in consequence, with some deformity perhaps, and pain on pressure, will often be the only symptom of fractured rib, with impaction in the lung.

The *circulation* must frequently be observed, as indicating some obstruction, in augmented cardiac action; local lesions or interuptions, as productive of embolism, etc., must be carefully looked into. Sources of compression in case of varix, and numberless other contingencies, demands careful examination of these organs.

The *digestive tract*, will frequently demand particular attention. Thus severe and protracted vomiting, may proceed from cerebral lesions or gastric irritation; the former being often unaccompanied by nausea, more presistent, and continued long after the stomach has been completely emptied, will frequently direct attention to the seat of the morbid action.

The *urinary secretion* is to be examined, for many purposes, both diagnostic and prognostic, and is rapidly becoming recognized as one of the most reliable indications of deep-seated morbid action. In determining upon instrumental treatment, of any kind, or for any purpose, the existence of albumenuria or diabetes, would decidely contra-indicate it. The existence of oxaluria, and many profound vital charges can only be positively told by urinalysis, as well as nervous exhaustion, and the like. Strange to say, however, as shown in another place (*Lithiasis; Surg. Therap.*) urinalysis is of little importance in the calculous disease, as there may be no stone and the lithic elements in excess, or a large calculus, and no evidence of it found in the urine. As a means of

estimating the condition or activity of waste and repair, we have no better guide than an examination of the urine.

The *genitals* often present useful indication, as hernia, due to urethral stricture; epilepsy, induced by congenital phimosis and preputial adhesions to the glans. In case of alleged rape, the absence of the penis, or some other potent impediment, will acquit the accused; or in alleged gonorrhœal communication, can only be determined by examination of the party charged with the offence.

The *skin* often presents valuable indications of the extent of morbid. The pallor and lowered temperature in extreme anæmia; the scarlet color and elevated temperature, of inflammatory conditions; the clammy condition on the approach of death; and the irritation from innervation, are but a few examples of the importance of carefully examining into the state of the skin.

Finally, the *tout ensemble*, as the French say, as the haggard, anxious expression, the waxy appearance of the surface; and the generally deranged functional activity, as seen in the cancerous subject towards the close of the case, should receive early attention. So also the evidences of congenital syphilis, as the aged, worn look, and other well known general features, must not be overlooked.

The microscope, ophthalmoscope, exploring needle, and the test-tube must be at hand, and the surgeon who is desirous of fulfilling his whole duty to his patient, must familiarize himself, as much as possible, with their use. I have found the ophthalmoscope so indispensable, in many ways, chiefly to throw light into cavities where the patient cannot be placed in a favorable position, that I carry the pocket instrument of Nachet with me habitually. It has the advantage of having an unusually large mirror, or reflector,

is very small and compact, and I strongly advise all students and young practitioners to procure one and perfect themselves in its use.

Chemical examinations, while of little value in surgical diagnosis, may be valuable in determining the elements of urinary calculi, and thus furnish a guide to the nature of the morbid process that results in the formation of the stone. In other particulars I have no knowledge of its being of any special value in surgical practice.

The *exploring needle* must never be neglected, in examining all fluctuating swellings, and no such swelling should be opened until we have accurately learned the nature of the contents.

What has been written is intended solely as an outline of the method to be pursued in constructing a theory of the case in hand. It cannot, as said earlier, include the whole subject, as that would involve the whole field of medicine. Apart from purely personal considerations, the surgeon should remember that no matter how extensive the experience of any one practitioner may be, it will require the experience of very many to construct a scientific and perfectly reliable treatise. It is not alone the patient and surgeon in an individual case that is benefitted, but society and the whole profession, if the best use is made of opportunities.

Let us next consider the second element in our scheme. viz.:

2. *Etiology.*—By *etiology* we mean that department of medicine which treats of the causes of disease, being derived from two Greek words, signifying cause and disease. To judge from many of our text-books it would seem that writers and practitioners generally considered the course of

morbid processes to be the reception of some injury, when, as a matter of fact, the morbid process is frequently latent, only waiting for some cause to fan it into life.

As said elsewhere (*Surg. Therap.*) it is hardly possible to determine the proper measures to be employed in the treatment of a malady, without having some rational conception of the causes at operation to maintain the morbid action. Under some circumstances, operative measures are imperatively demanded; in others they would expose the sufferer to dangers that might be averted and their practice be unpardonable. The conscientious practitioner will use every exertion to devise the best treatment for his patient, and an accurate knowledge of his condition is of the first importance.

Etiology naturally divides itself into two classes of causation, the predisposing, or maintaining; and exciting, or determining.

(*a*). *Predisposing causes* are all such influences, bodily conditions, or circumstances that make one person more liable than another, or that expose all mankind to accident or disease. For instance, a preternaturally long mesentery, a patent condition of the peritoneal vaginal process, or an unusually large opening at the inguinal canal or elsewhere, will expose the individual to greater danger of hernia than his neighbor more happily circumstanced. At the same time the very existence of the inguinal canal exposes *all* men to hernial protrusions. In both instances they are alike predisposing causes. Also in the case of fracture, the form and texture of the bones, advanced age of the individual, and an occupation that exposes the person to accident, are to be considered predisposing causes.

While both classes of causation must receive due attention,

it seems proper to consider those under this head as far more important, and demanding closer attention than those of a determining character. It is fair to conclude that these causes are permanent, and that they not only place the sufferer in danger of a renewal of the accident or morbid phenomena, but that their continuance exercises a very potent influence on recovery. How absurd it would be to attempt to treat with any hope of success, a case of necrosis from phosphorus, poisoning,and still permit the victim to follow his accustomed avocation. Simple as it sounds in theory, however, it is often exceedingly difficult in practice; indeed, there are many cases in which the predisposing causes cannot be discovered at all. As in malarial and epidemic fevers, the predisposing cause is only recognized as a mysterious "receptivity;" individuals, side by side, do not suffer alike, although exposed to the same influences; indeed, some escape entirely, even when no attempt is made at prophylaxis.

That the predisposing conditions may operate as maintaining, needs little argument. Take fracture, from slight force, in an old man. A similar exertion of force, in the case of a young man, would have produced no such result. The predisposing cause is recognized as a preponderance of the inorganic elements of bone, giving the organ increased brittleness, perhaps greater porosity, certainly less elasticity. These same conditions act as maintaining causes as well, as the break will heal with less readiness and union be much less perfect, than if the proper elements of bone were furnished in due proportion. We must consider it our duty, therefore, to search for the predisposing causes as an absolute prerequisite of cure.

Exciting or determining causes, are those immediately productive of the disease or injury. Swallowing irritant poison

would be the exciting cause for the resulting gastritis; application of fire to a burn; blow of a fracture, and so on. As a means of diagnosis solely, and with little if any reference to treatment, an understanding of the exciting cause is of the first moment. A man is seen lying in a state of coma, and we learn he has fallen on his head, or sustained some injury to that part. We at once think of concussion or compression of the brain, and our diagnosis is then half made out.

In the case of morbid action it is of far less moment. A tumor may follow a blow, or an ulcer a wound or contusion. In neither case can the injury be looked upon as a *cause* of the tumor or ulcer. Other forces, predisposing or maintaining causes, are at work, and are almost entirely responsible for the condition. True they might never have appeared but for the injury; on the other hand, the injury would have produced no such effect on a person not predisposed to their formation.

A further consideration of causation must be referred to special accidents and morbid processes; it is utterly impossible, at this time, to treat the subject other than in the most general way. The causes are as many as there are accidents or diseases, and each separate case will need seperate and especial mention.

3. Prognosis.—This word is likewise derived from the Greek, from two words signifying, "to know beforehand." It is the "act or art of foretelling the course and event of a disease." While hitherto less systematized than the two branches of our topic previously considered, it is of the first importance, and demands careful consideration and study. The topic may be appropriately considered under four heads; *viz.*, as to the continuance of life; as to the preservation of

function; as to the preservation of symmetery; and as to the duration of the case.

(*a*). *Preservation of life*, contrary to a popular opinion, can never be determined upon with any degree of certainty. When we read of men carrying a musket ball in the heart forty years; another with five bullets in the skull; of a tamping iron passing through the brain, and life not only preserved but continued without apparent loss of comfort, we may well question whether extent of the injury can, in all cases, determine the extent of the menace to life. With the exception of injuries to the medulla, section of the spinal cord, or laceration of the aorta or some other large arterial trunk, almost all degrees and varieties of serious lesions, even of what are supposed to be organs absolutely essential to life, have been received and life preserved. It is scarcely within the facts to consider bodily health and vigor a reliable guide in prognosis, as many instances are recorded of feeble individuals having sustained severe injuries without loss of life, and robust persons succumbing to slight accidents. As far as the nature of the injury itself is concerned, with exceptions noted above, we must practice caution in reaching conclusions too hastily. Prognosis must always be unfavorable when the shock is profound, hæmorrhage copious, recuperative powers deficient, the existence of previous disease of a serious character, there is dyscrasia of any kind, and the sufferer is either plethoric or anæmic, a resident in unhealthy quarters, or has been subjected to the depressing influences of poverty. Traumatism as a rule, secures a more favorable prognosis than idiopathic or specific morbid action, particularly when the shock has been slight, the bodily vigor is good, and the case is seen sufficiently early. The condition of the mind will be found a highly important

consideration, and when there is much depression, and a morbid despondency, as often occurs in the case of the ignorant and superstitious—the prognosis must be guarded. Habits of intemperance, or prostitution, must exercise a very unfavorable influence on the result, as well as any habits that have a tendency to lower the vital vigor and tone.

While it is almost impossible to give any certain rules for determining the menace to life, the following conditions may be considered as usually unfavorable:

Mental sphere.—Prolonged coma, *primary* dilerium, great fear of death and conviction of it being impending.

Eyes.—Pupils immovable, particularly when dilated.

Mouth.—Dry and sticky; heavy brown coating on tongue, sordes on teeth; trembling of the tongue on protruding it; cannot protrude the tongue, the tip catching on the teeth.

Face.—Expression of terror, or absence of expression; answers correctly, but no change in features. Extreme pallor; waxy appearance.

Chest.—Varying irregularities of respiration; feeble, rapid cardiac action. It has been observed (RAUE, *Path. and Diag.*) that when the heart's action and respiration become synchronous, death is imminent. That is, the organs of respiration and circulation being supplied by the sympathetic and cerebro-spinal axis, but not equally, there is not an exact synchronism, in health, in the regular proportion of one to four; there is a slight but perceptible variation, say 1 to 3.9; when, therefore, it becomes *exactly* one to four, it is evident that the nerves of one system have ceased to act, and the two functions are carried on by those of the other. Death is then imminent.

Pulse.—Weak, fluttering, irregular, compressible.

Temperature.—A rise of more than 7°, will be ominous,

as the fall, in reaction, will be far below normal; a fall of more than 3°, will nearly always foretell death. Yet in the *Med. Advance*, Vol. 7, p. 147 is a case by Dr. Claypool, of Toledo, Ohio, in which the fall was 7°, and death was delayed 72 hours. This case, however, as far as I know, is entirely unique.

Urinary organs.—Suppression or great dimininution of the urine: albumenous urine.

Intestinal tract.—Involuntary stools, or occasionally entire want of stool. Finally, extreme general prostration and debility, so that the patient slides down off the pillow, and clammy coldness of the skin. Other indications, in special cases may rise, but in general most or all of the preceding may be looked for in fatal cases.

(*b*). *Preservation of function* can usually be foretold with a greater degree of accuracy than that of life. Complete destruction of an organ, as a kidney—will of course permanently destroy function. Complete divisions, with wide retraction, of a set of muscles, as the flexors of the leg, will probably forever destroy their usefulness. The prognosis, in this particular, will, therefore, depend entirely upon the anatomical knowledge of the surgeon, as well as his familiarity with the processes of repair, and the physiology of the parts injured or involved.

(*c*). *Preservation of symetry*, must be foretold by the exercise of the same knowledge. Wounds with extreme retraction or gaping, can hardly fail to heal with some scarring, the degree depending upon the time elapsing since the accident; extensive burns must be followed by more or less deformity; fractures of the nasal bones, that are not reduced for some hours, are well known to result in defigurement, as also comminuted fractures generally, particularly

with much displacement. Our prognosis in this respect, therefore, is likewise to be founded upon our surgical knowledge and skill.

(*d*). The *duration of the case*, can only be prognosticated, by comparing it with similar conditions, either occuring within the range of our experience, or as derived from reading. Under the most similar and favorable circumstances, there must be much diversity in this respect, the vital resistance, the nature of the surroundings, the bodily health of the patient, and a host of minor considerations, being essential factors. Next to dogmatic opinions as to life or death, nothing can be more hazardous than to venture hasty opinions on the duration of the case. There are so very many apparently trivial symptoms and conditions to be considered, that a non-commital course is always to be pursued.

I have here concluded a hasty and necessarily imperfect account of the leading principles of surgical diagnosis. If no other object has been attained, certainly I can scarcely have failed to prove the truth of the doctrines of our introduction, and shown that the accomplished surgeon must possess an amount and kind of information that can scarcely be demanded of the general practitioner. Without a perfect understanding of what is demanded and expected of him, none should engage in the practice of this complex department of medicines, unless he is to be satisfied with mediocrity —and all such the profession can very well afford to dispense with.

PART SECOND.

MINOR SURGERY.

Minor, or lesser surgery, is that department of medical practice which has to do, more particularly, with the more common and every-day surgical conditions that are presented to the medical practitioner, and do not require special or peculiar surgical skill or knowledge. The catalogue of subjects embraced under this head would include the instruments needed, the methods of keeping them in order, and instruction as to selection of the same; the ordinary dressing of wounds and injuries, with some instruction as to the methods of repair; the construction and application of bandages, splints, and plasters; catheterism; vaccination, and in short the many duties, of a surgical nature, that are daily demanded of the general practitioner, and the manner of affording temporary relief, in cases of accident, until more leisure is found for permanent treatment, or a properly qualified surgeon can be procured.

It can justly be demanded, that all who desire to devote themselves to the responsible calling of the surgeon, should first thoroughly master the elements of the science. For this reason a treatise on Minor Surgery should form the text-book for the first year of study, the subject bearing the same relation to surgery that dissection does to anatomy, or the common rules of arithmetic to higher mathematics. There is little of the science in this department of surgery, the art claiming almost exclusive attention. Whilst a reversal of

the ordinary rules of systematic education, the circumstances here require attention to the "tools of the trade" before we are ready to comprehend the indications for their use.

In private surgical practice, minor surgery must necessarily demand a large share of the attention of the surgeon, he being compelled, from want of trained assistants, to superintend the dressings and all the details of preliminary and subsequent treatment. In public or hospital practice, much of this is relegated to the assistants and other internes, who should possess sufficient skill to entirely relieve the surgeon of all care in such particulars. Speaking from personal experience, I can assure the aspirant for surgical distinction, or hospital preferment, that the surgeon will prefer accurate knowledge of the principles and practice of minor surgery, to theoretical knowledge of the higher departments. Let the student and young practitioner, therefore, devote a large portion of his time to the study of the principles of minor surgery, and familiarity with its practice.

Part Third.

INSTRUMENTS FOR DRESSING, AND MINOR OPERATIONS.

For minor operations and dressing wounds, the surgeon carries a small pocket case, containing instruments, for the most part, shutting into their handles like a pocket knife, the number and style of the instruments varying with the taste or fancy of the surgeon. Those engaged in special surgical practice usually require a small case with a limited number of instruments; those in country practice, who make no special pretensions to surgery, require a larger case, one containing instruments, sufficient in number and size, for the ordinary emergencies in medical life.

For the former, the instruments might be as follows,

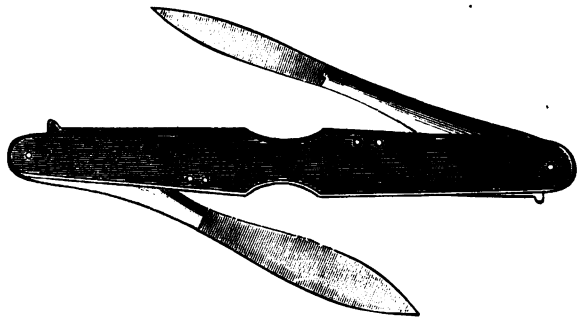


Fig. 1.

either each one in a separate handle, or two blades to each handle. The latter is much the more convenient, if care is

taken not to have instruments in the same handle that are to be used consecutively. The blades had better be provided with either a spring or sliding catch, to prevent accidents from an unexpected closure of the knife at critical times. The instruments in my case, one that I have used for nineteen years, are :

FIG. 2.

Scalpel; curved, sharp-pointed bistoury; curved, probe-pointed bistoury; tenotome; tenaculum; aneurism needle; exploring needle; exploring trocar; needle and artery forceps combined; dressing forceps; straight scissors; three silver probes; small pointed, Nelaton's bullet probe; No. 8 jointed silver catheter, male and female; grooved director, besides different sized needles, silk, silver wire, iron wire, pins, harelip pins, and adhesive plaster. With such a case nearly every minor operation may be performed, even some of the major; and when the rural practitioner adds a small saw and an extra large scalpel, he will be quite well equipped for the treatment of a majority of the cases of accident that come to him.

The *scalpel* is the only instrument that varies much in shape, the more frequent forms are as shown in the accompanying cut:

The last will be found the most generally useful, I think, being supplied with a cutting edge on both sides, and thus being particularly adapted to opening abscesses as well as the ordinary purposes of dissection.

The *curved bistouries*, are as seen in the annexed figure, varying only in the degree of curve.

The tenotome is shown in the upper blade of Fig. 1, and

may be made with a sharp point, as in the sketch, or blunt.

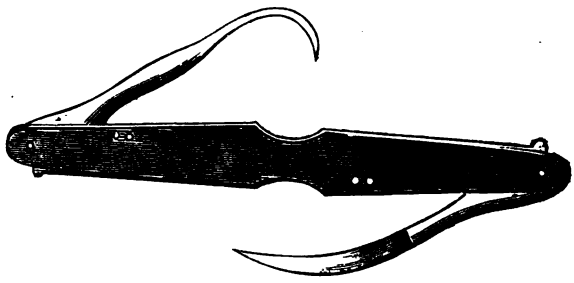


FIG. 3.

Perhaps for young surgeons the latter will be preferable, as there being less danger of injuring the deep structures, they will have greater confidence in its use.

The *tenaculum* is shown in the lower blade of Fig. 3, the curve being greater or less as the operator may fancy.

The *aneurism needle* is simply a blunt tenaculum, with an eye in the point, for carrying a ligature around an artery.

Exploring needles are sharp-pointed needles, set in a handle, grooved on one side. On pushing them into suspicious swellings the groove permits the escape of some of the contents, which will settle the character of the swelling conclusively. The *exploring trocar* is a very delicate trocar and canula, which may be used for the purpose of evacuating small cysts, or for purposes of exploration only.

FIG. 4.

Needle and artery forceps combined, are similar to the

ordinary dissecting forceps, except that they are furnished with a catch, so that they may be held firmly closed, when once applied to an artery or holding a needle. The inside

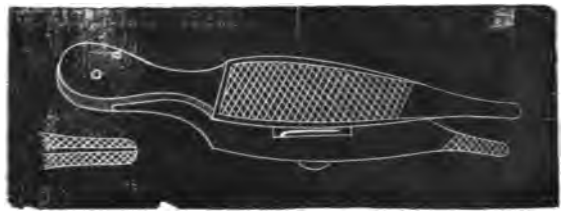


FIG. 5.

of the points are grooved for the accommodation of the needle. They are designed to shut closer than ordinary forceps, the points meeting throughout their whole length. In testing the excellence of the instrument, close it firmly, and if the points do not separate on extreme pressure, they are good. Otherwise they should be rejected.

Dressing forceps may be made as in Fig. 6, known as "ring" forceps, or an ordinary pair of dissecting forceps

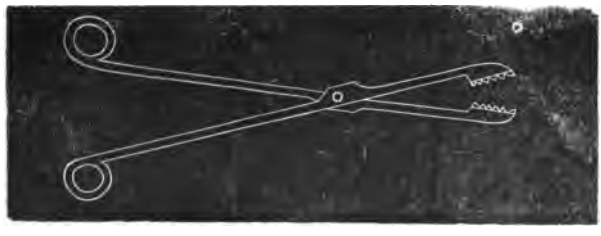


FIG. 6.

may be made to answer every purpose. The former are better, as with attention to the points, which may be broadened and slightly hollowed out, they will answer for polypus forceps as well.

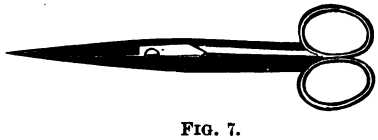


FIG. 7.

Scissors are of various shapes, the straight form with the shanks meeting

closely are to be preferred, as they occupy less room in the case, and do not require so much space to be opened in.

Probes are usually made of German silver, and are about four inches in length, with a button on one end, and th

FIG. 8.

other either flattened out and pierced with an eye, or fashioned with a blunt point. With these probes, one of them can be furnished with a male screw, which fits into a small extension with a porcelain button, making an excellent bullet probe according to Nelaton's pattern.

A *catheter*, about No. 8 in size, in a number of sections fitting into each other with a screw, will be indispensable. Both male and female catheter can be thus at hand when needed.

Directors are made in a number of styles, the more generally useful, I think, will be that shown in Fig. 9. For some purposes the finishing at the proximal extremity in the form of a scoop, will be found advantageous.

FIG. 9.

The remainder of the list of instruments will not need special mention, except that the needles are more generally useful when made with a double cutting edge and a short curve. There are a number of styles, however, some of which may be useful in exceptional cases. One of them, designed by DR. LEVIS, of Philadelphia, is deeply grooved, in place of the customary eye, into which the wire is twisted; the object is to avoid the increased size of the shank which is inevitably produced by using wire in the ordinary

needle. Another modification is to have the proximal end of the needle fitted with a female screw, into which the wire is inserted by a screwing motion. While these needles are quite satisfactory in practice, I have never found it necessary to use them, the same object being sufficiently well obtained by securing a broad cutting edge.

In the volume on *Emergencies* I have referred to the "accident case" that I am in the habit of using, and which all practitioners will find useful; at present it will be proper to refer to a more extensive and complete arrangement, which is particularly desirable for hospital purposes, and in private operating rooms.

The dresser or assistant should provide a "dressing tray," in shape and size like the ordinary "butler's tray," covered with enameled cloth, and supported by a light folding frame,

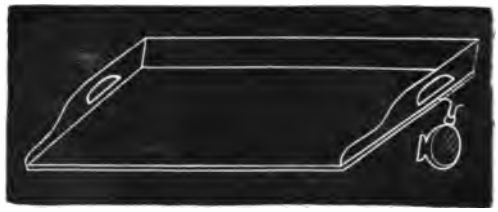


FIG. 10.

so that it can be readily moved about from place to place. This should be kept constantly supplied with the following articles, and deficiencies renewed, every day, as the first duty in the morning:

Chloroform; Ether; Amyl nitrite; Hypericum; Arnica; Calendula; Hamamelis; Cosmoline; Aqua ammonia; Perchloride of iron solution; Sweet oil; Collodion; Absorbent cotton, or Lint; Adhesive plaster; Isinglass plaster; Pincushion, well stocked with pins, etc.; skein of silk; silver and iron wire; Bandages; Soap; Towels; Sponges. Pieces of old linen or muslin for compressess; and a tin hand-

basin hanging from a hook in the side. It will be well to keep probes, forceps, and scissors also on this tray, and a razor will often be found very useful.

Part Fourth.

MATERIALS USED FOR DRESSINGS.

The various articles used in dressing wounds and the like, should be familiar to the dresser, even though some of them he may never use. Each surgeon will have some articles added to the list which he prefers either from habit or knowledge of its excellence, and it would be, if not impossible, unnecessary to attempt to include them all in our description. Those in more common use are as follows:

Sponges are an absolute necessity, and must be selected with care, and kept scrupulously clean. The finest specimens are usually kept in the shops for surgical use, and must be free from grit or sand, of close texture, and absolutely clean, as far as possible. They should absorb quickly, and are better in proportion as the large openings, or oscula, are few in number. In using sponges to cleanse raw surfaces, care must be had not to rub, "or scrub" the sensitive parts; the water may be allowed to drip over the surface, or the sponge may be lightly pressed on the part. In absorbing blood, however, during the progress of an operation, the sponges may be pressed down deeply and firmly into the wound, both for the purpose of greater efficiency, and to avoid soiling the bed or table with bloody water. They should always be squeezed out in water, two or three times, before using for this purpose, as it will very greatly increase their absorbing power. Sponges that have been used in dressing ulcers of a specific character, or about the persons of those suffering from erysipelas, or any infectious or contagious disease, must never be

used a second time, at least not on another person. Under other circumstances, as in ordinary dressings, or operations, they should be scalded in *hot* water, as soon as their use is over, thoroughly dried, both by squeezing and exposure to the sun. In all cases, perhaps, it will be safer, and much lessen the danger of conveying infection, or setting up septic conditions, to destroy sponges that have been used four or five times, particularly when they have been saturated with pus. In hospital practice, I make it a rule to destroy all sponges after their second using. Even new sponges should be well cleaned, both by beating them with a switch, and washing in hot, followed by rinsing in cold water.

LINT is an article that occupies a very prominent place in the dressers outfit. It is made in different ways, and of different material, either kind being perhaps equally good in general, while special cases may require one variety in preference to another. *Common lint*, is simply the ravellings of old linen. *Charpie*, is made by cutting pieces of old linen into squares, of about two inches, and unravelling it thread by thread. *Patent lint*, is made by scraping up the surface of old linen with a dull knife, rendering the surface fleecy and soft. The patent lint sold in the shops is made by machinery, and differs somewhat in appearance, from the improvised variety, but has no particular excellence, as far as I know. As a substitute for the above, and rapidly taking its place in both private and hospital practice—*absorbent cotton* is an admirable article of dressing. It is made by taking the finest and cleanest specimens of cotton, freeing it of oil by treating it with potash, or even ether, boiling out the potash, and thoroughly drying. Manufacturers then prepare varieties of anti-septic cotton, by treating it with both borax, salicylic acid, or other medicinal substances, but in Homœopathic practice such preparations will be but seldom, if ever needed.

Finally picked *oakum* is also used in lieu of lint, by some practitioners, the tar being supposed to have some antiseptic properties.

Whether we use the different kinds of lint, cotton, or oakum, application to wounds, or for other purposes, is made by arranging the article in different shapes, the more common forms being as follows: A *pledget* (*plumasseau*) is made by rolling up a mass, of suitable size for the object sought, and flattening it between the hands. It is used to make a compress for an ulcer, to fill up depressions when applying splints or bandages, or to apply to a suppurating surface as an absorbent.

A *roll* is made by rendering a pledget cylindrical, by rolling between the hands, and tying a string about the middle. It is used for arresting hæmorrhage, by applying a bandage over it when laid parallel to the bleeding vessel; also to apply to deep wounds to absorb the discharges. When used for the latter purpose, the string is left attached, and cut long to facilitate its withdrawal.

A *bullet* is a small piece of lint rolled up, between the fingers, in a spherical form, as large as an ordinary marble. They are used to fill up suppurating or discharging cavities. It is a good practice to count the number of bullets used, and noting the number, see that all are removed when the parts are dressed. A deep abscess was once filled this way; the cavity not closing, after a suitable time had elapsed—was opened, and a bullet was found that had not been removed.

The *pellet* is made in the same way, is used for the same purpose, but is much smaller.

The *mesh* is similar to the roll, but the fibres are left loose, not rolled or twisted up hard. It is used to insert into deep wounds or sinuses, to prevent their healing at the outlet.

The *tent* is used for the same purpose, and is made by

twisting a portion of lint into an elongated cone. It may be covered with cerate to pervent its adhering to the raw surfaces. Sponge tents, sea-tangle, etc., do not enter into our list, as they are used for a different purpose, dilation, and are not recognized portions of surgical dressings.

The *tampon*, is a mass of lint, or a number of bullets, crowded into a bleeding cavity to arrest hæmorrhage. It is not of frequent use in surgical practice, being more applicable for uterine hæmorrhages as occuring in the practice of the obstetrician.

COTTON, the common article found in the stores, is an article that is useful for a variety of purposes in surgical practice. It will be found very useful in filling up depressions of a part prior to applying a bandage; to pad splints; to cover prominences that would be subject to injurious pressure or irritation, and for a host of similar purposes. The oil that it contains makes it very unsuitable for application to moist surfaces, or where there are purulent discharges; under such circumstances lint should be preferred.

ADHESIVE PLASTER is of various kinds, and in some form or another is a constant necessity in practice. The varieties of plasters are almost endless, some being used for retaining purposes solely, or to preserve coaptation of wounds; and others for medicinal purposes, or those of counter-irritation. With the last we have nothing to do, they not entering into the treatment of any case under our methods; the medicated plasters are likewise seldom if ever employed by the Homœopath, and need no particular mention. Opium, Belladonna, Lead, Cantharis and other medicinal agents are used in the preparation of the medicated plasters, in addition to the ordinary resinous material necessary to give the adhesiveness requisite. With the exception of the drug, therefore, which

is many times a proprietary preparation, the manufacture does not differ from the ordinary retaining plaster.

We shall consider three varieties, the ordinary adhesive, and isinglass plaster, and one that is designed to sustain considerable traction, used in making extension in the treatment of fractures and the like.

Adhesive plaster, is made by mixing resin and plaster of lead together, in the proportion of six to thirty-six, and spread upon muslin by machinery. To prevent its cracking when cold, a little soap is added. The plaster thus made is applied by slightly warming it, which softens it, thus adding to the adhesiveness. The objection to this article is the difficulty in detaching it, as the plaster becomes detached from the muslin, and adheres to the skin. There have been many modifications and improvements, in consequence, of late years, many of the plasters being protected by patent. The best form is made of a solution of rubber spread on strong muslin, which does not require either heat or moisture to apply. In all cases in which firm support is required, whether the parts are dry or covered by secretions, there can scarcely be a better plaster than this. The number of varieties make it impossible to notice them all, and as a matter of fact there is often but little choice. The preference is to be given to those which are unmedicated, have good adhesive qualities, do not irritate the skin, are easy of application, and can be readily removed.

Isinglass plaster is made of isinglass, dissolved in alcohol; TOWNSEND (VELPEAU *Oper. Surg.* I, 128), gives the following formula: "An ounce of isinglass is moistoned by two ounces water, and let stand for an hour or two until quite soft; then add three ounces and a half of rectified spirits, previously mixed with one ounce and a half of water. Plunge the vessel into a saucepan of boiling water, and the solution will be

complete in a few minutes." With a broad varnish brush paint the solution on a sheet of oiled silk, or other thin light fabric, which has been stretched on a board. When this layer is dry, apply another, drawing the brush at right angles to the former layer; and so on until four or five coats are painted on. The last layer or coat must be slightly reduced by adding a little water. For all ordinary purposes, as dressing wounds, whether large or small—and after operations. I know of nothing that is superior to this plaster; for purposes of extension, as in fracture, it will not be strong enough. It is applied by moistening it with a damp sponge, and the sole objection to it is the fact of its becoming loosened by the discharges.

Plasters for extension, are usually made of some of the solutions of India rubber, spread upon strong muslin, leather, or canvas. They are used in treating fractures by the "American method," or for any purpose when great strength or adhesiveness is required.

COLLODION is a solution of gun cotton in ether, and is a very useful article of dressing when it is essential to exclude the air. It is applied by painting it on the part with a camels hair brush, or laying a piece of gauze, or lint, or a small piece of absorbent cotton on the wound, and painting the collodion over it. The ether rapidly evaporates, and leaves the cotton in the solution firmly adherent to the parts. To a raw sensitive surface, the collodion could scarcely be borne, and would cause much unnecessary irritation; the wound, therefore should always be closed, and the collodion applied over the other dressings, as adhesive strips or sutures.

CERATES AND OINTMENTS are practically one and the same thing the latter being somewhat softer than the former, from a slight excess of the oleaginous principle. Cerates are made by melting fresh lard and fine wax together in the

proportion of one to two, stirring them until cold. They are sometimes medicated, particularly with Arnica, Calendula, Hypericum, etc., the drug being in the proportion of one fluid-ounce to the pound of cerate. Cosmoline, or Vasseline, of which some of the parafines or extractives of Petroleum are used as a base, are very much used, and have a wide reputation as effective anti-septic dressing. Cerates and ointments, in Homœopathic practice, are chiefly used to protect open wounds, and the like, from adherence of the dressings; they *may* be used for medical purposes, but nothing is promised in this way that cannot be readily attained by other and more rational treatment.

POULTICES, otherwise called CATAPLASMA—are articles of dressing that are in frequent demand. Formerly there were a great many varieties of poultices used, for many different purposes, but of late years, and particularly in our school of practice, the number has been much diminished. I think all kinds of poultices may be included under three heads, and perhaps but one form under each, *viz.*, emollient, stimulating and antiseptic.

Emollient poultices, are those designed to allay irritation, and indirectly, by the attendant heat and moisture, suppuration is facilitated, and dead tissues more speedily removed. The common bread and milk poultice, familiar to everyone, is a popular form. Linseed meal, however, is unquestionably the most satisfactory, and is prepared as follows: Take *unpressed* linseed meal, say four ounces, and mix it slowly with ten fluid ounces of water. Spread on linen cloth, and apply to the part according to directions given below.

Stimulating poultices, may be made by adding brewers yeast to the flaxseed cataplasm, or some other stimulating articles, as mustard—or a proper yeast poultice may bemade.

According to the *British Pharmacopœia*, the preparation is as follows: Take of beer yeast, six fluid ounces; wheat flour, fourteen ounces; water (100° F) six fluid ounces; mix the yeast with the water and stir in the flour, afterwards standing the mixture before the fire until it "rises." It is used to allay pain, as well as to stimulate feeble supurative action. It is rarely if ever necessary, when the surgeon is familiar with the resources of our Materia Medica.

Antiseptic poultices are used, as their name would indicate, to guard against septic poisoning, to correct fœtor as well as to arrest (?) gangrenous process. The addition of Carbolic acid, Salicylic acid, or some other known antiseptic, as Chlorinated soda—to the common emollient poultices will answer every purpose. If it seems desirable to make a poultice for this purpose alone, Charcoal or the Chlorinated soda may be made into a poultice, as follows: Powdered Carbo vegetabilis, say half an ounce, is mixed with two ounces of bread crumbs, one and a half ounces of linseed meal, and ten fluid ounces of boiling water, or, four ounces of linseed meal, eight fluid ounces of boiling water, two fluid ounces of Chlorinated soda.

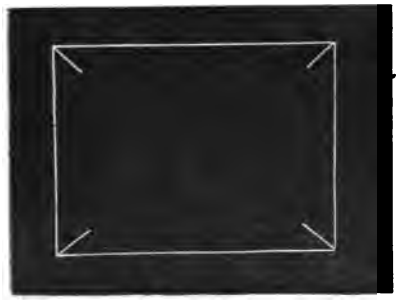


FIG. 11.

In preparing and applying poultices of any kind, the following is the neatest and best method: Take a piece of linen, cut square, an inch or two larger than the space desired to be covered. Cut the corners, with scissors, as in the figure. Then spread the poultice on with a thin knife, or spatula, to within an inch or two of the margin. Next fold down the edges, having previously spread a thin,

soft piece of gauze or cambric over the poultice. The folded margin, not being covered with the poultice, may be anointed with cerate, thus avoiding adherence of the linen to sensitive parts. The part should be shaved, if hairy, and the poultice changed as often as it becomes dry.

COMPRESSES are pieces of muslin, or lint, used for making compression on deep parts, or to protect raw surfaces from direct contact with bandages. They are made in many ways, most of them being simple modifications of three forms. Thus, the first (fig. 12), is made by folding muslin to several thicknesses, until the usual size or thickness is obtained, and is used to make pressure equally distributed over a limited extent of surface.

FIG. 12.

The second, called the *graduated*, or pyramidal compress (fig. 13), is made by making each succeeding fold shorter, so that the width is greater at the bottom than the top. It is used to make compression deeply, as over an artery or fistula. A modification of this (fig 14), is made by folding a number of pieces of muslin into squares of a constantly diminishing size, and connecting them with a stitch taken through them all when placed in position. It is used where pressure is to be carried deeply, but only to be exerted on a small point.

FIG. 13.

FIG. 14.

The third called the *cribriform* compress, is a single thickness of linen placed over a raw surface, and clipped full of holes to facilitate the escape of the discharges. Sometimes such a dressing is needed on the end

of a limb, or a stump after amputation. It may, also, be needed to apply a sheet of lint, spread with cerate, in the same way, and can be applied smoothly by making what is known as the "maltese cross," see fig. 15. Fold a square piece of muslin, of the requisite size, once on itself (*a*), having the corners and edges neatly meeting. Fold it a second time, in an opposite direction (*b*). Fold it a third time, diagonally (*c*), and with scissors cut it almost to the apex of the fold along the dotted line (*c*). In applying it, place the centre on the end of the stump or part, and smooth one arm of the cross over the part. The next arm is then to be folded in, overlaping the first; the arm on the other side in the same manner, and the remaining arm covers in all the ends—Thus:

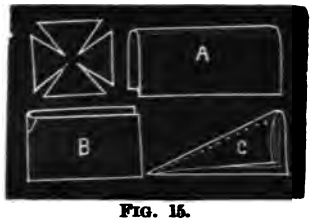


FIG. 15.

BANDAGES, or "rollers," as they are otherwise called, are strips of linen, muslin or flannel, in width varying. and cut from half an inch to three or four inches, and in length from two to ten yards. The material must be unsized, free from seams or knots, and of thickness or quality depending upon the purpose to which it is to be applied. For ordinary uses, old linen, as sheets, is the best material. Unbleached muslin comes next in order, and for some purposes flannel may be employed. When possible it is better to have your bandages in an unbroken strip; when old sheets are used, they should *never be stitched together;* no matter how flat the seam may be, a reverse turn coming on one of these seams will not only frequently prove a source of

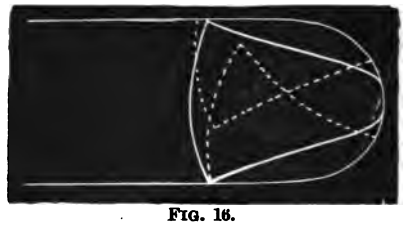


FIG. 16.

annoyance to the patient, but may even become an element of danger. The separate pieces, however, must not be less than six feet in length, and enough of them may be rolled up into one bandage to equal eight or ten yards. The selvage edge must always be torn off, and threads or ravellings not removed until the roller is made. The strips being prepared, make a few turns or folds of one end, on the knee, until a cylinder of some solidity is secured. Then, in the absence of a machine for the purpose, seize the cylinder with the thumb and first two fingers, applied at opposite ends of the roll, in the right hand, the unrolled portion uppermost, and to the left. The unwound portion is then seized between the thumb and forefinger of the left hand, and the bandage wound by rotating the roller, and exercising the necessary tension to give it solidity, with the left hand. A little practice will enable the student to form a hard, smooth roller, much neater and with less trouble than any of the ordinary machines will make. The roll thus formed, the threads and ravellings are to be pulled off, at each end of the cylinder, and the free end fastened with a pin or strip of plaster. The roll, for purposes of description, is known as the "body" (*a*), and the free end (*b*), the "initial extremity." The dressing tray should be kept supplied with rollers of different sizes, and the student should practice preparing them

FIG. 17.

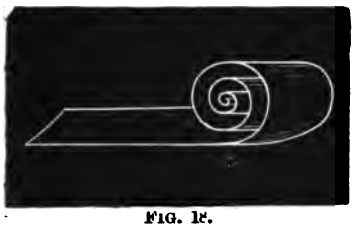


FIG. 18.

until his motions are easy and rapid, and the bandage can be rolled up hard and smooth, without fatiguing the hand.

There are three general forms or varieties of bandages, which will be described at this time: *Simple rollers*, are as depicted at fig. 18. *Compound bandages* are those in which two or more rollers are combined, as the "double-headed" (*a*); "T" bandage (*b*); double "S" (*c*); cross (*d*); and

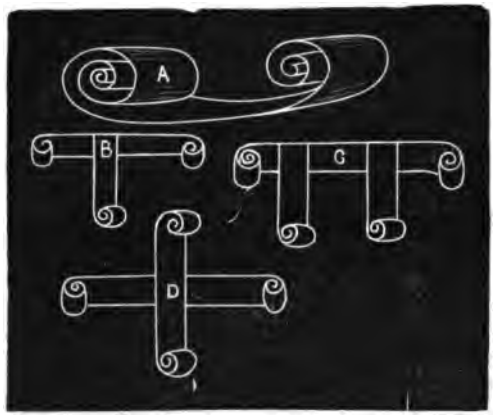


FIG. 19.

others to be noticed in their proper places. There is a form of bandaging, used in emergencies, of an improvised character, devised by M. MAYOR, of Lausanne, Switzerland, in 1832, in which cravats, handkerchiefs, towels, or the like, take the place of the ordinary methods, and while fair substitutes for the more artistic roller, I think they are little used to-day, at least in this country. To follow a time-honored custom, however, I shall give his method as we pass along.

Sutures, or material for making stitches in closing wounds, is finally to be noticed. There are three kinds used by modern surgeons, silk, metallic, and animal fibre. *Silk* is the ordinary white sewing silk, or, saddlers' silk. It should not, I think, be waxed, or even soaped; when care is taken to secure

a good quality, and hard twisted, there is no necessity for rubbing it down with anything. It is used for closing ordinary wounds. It *may* be treated with a weak solution of Carbolic acid, to destroy any septic properties that might attach to it when saturated with discharges, but I have never been able to see the necessity for it.

Metallic sutures, are made of tin, gold, silver, lead, iron, etc., and are to be used in wounds about the face, as their presence does not favor suppuration, as is the case with silk, and there is consequently less scarring. They are also useful in closing wounds in the cavities of the body, as they need never be removed, the irritation they produce being trifling. Hare-lip pins are analogous to sutures, being used for the same purpose; they are made of silver. After being pushed through both lips of the wound, silk is passed around both of the projecting ends, and tied in a figure of eight (vide *sutures*), or a rubber ring is slipped over.

Animal fibre, as cat-gut, horse-hair, deer's sinew, etc., is much used at the present day, particularly when sutures are used in wounds of the viscera, the external wound being at once closed. They are usually treated with Carbolic or Salicylic acid, to prevent septic poisoning, and may be cut off close to the knot, and the parts returned to the cavity. They are ultimately absorbed and carried off, and the external wound closed as if no deeper lesion existed.

Such is the list of articles to be provided for the dressing tray, or that may be needed in the treatment of the injured—other articles may be exceptionally useful, but there are few conditions that would demand articles of dressing not contained in the above.

Part Fifth.

DRESSING WOUNDS, AND SURGICAL INCISIONS.

Dressing wounds.—In the third volume of this series, "*Surgical Emergencies and Accidents*," this question has already been considered, at some length, but the general principles should be given at this time, particularly as some may not have access to the volume referred to.

The first consideration will always be the *arrest of hæmorrhage*. When trifling, chiefly capillary or venous, exposure to the air, temporary pressure, bathing the parts in hot water, or simply closing the wound, will be all that is necessary. If this is not successful and no vessels are wounded of sufficient size to require the ligature, mild styptics may be used, as a weak solution of Cupric sulphide, Monsel's salts, Alum, or any astringent agent. Should the bleeding proceed from wounded arteries of size, the vessels must be taken up and tied, or otherwise secured, either at the cut extremity, or in the continuity. This may be accomplished by ligature, torsion, or acupressure. When the number of vessels springing is large, owing to unusual vascularity of the part, the main vessel must be tied, by exposing it above the wound. As the majority of these operations more properly belong to major surgery, the reader is referred to "*Surgical Emergencies*" for details. At this time we will simply describe the process of ligation in the wound,

The lips of the wound being held apart so that a full view

of the whole extent can be obtained, the bleeding orifice is to be found, and either hooked up by the tenaculum, or seized with the artery forceps. The vessel is then to be drawn out, say to the extent of a couple of lines, and secured by tying it firmly with silk thread, of suitable size, with a square or reef-knot (fig. 20). It was formerly the fashion to make a double turn, or cross, at the first part of the knot; it is not only a clumsy procedure, but really detracts from its security. A little practice will enable one to make the proper knot with facility, which should receive attention, as any other form or modification of the above would produce a very insecure hold on the vessel. The first part of the knot having been made, draw it tight, and secure it by pressing the tips of the two forefingers on it, in the wound, and draw the second part tight with the thumbs and other fingers, keeping the forefinger in position until the knot is drawn tight and completed. Then cut off one end of the ligature, close to the knot, and bring the other out at one of the angles of the wound, viz., that which is reached by the shortest route, *not* the most dependent. Should the vessel be only nicked, or partially divided, pass a ligature around it in the following way: Arm an aneurism needle with the ligature, drawing it through the eye only for an inch or two. Pass the needle under the vessel, and seize the short end of the ligature with the dressing forceps. Withdraw the aneurism needle, and the ligature is passed around the vessel, which is to be tied as above. In the absence of an aneurism needle, a silver probe, with an eye, may be used, being bent into the proper form.

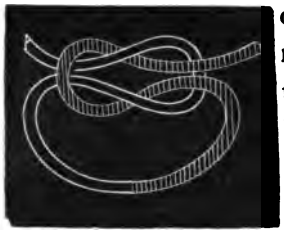


FIG. 20.

In cases in which the hæmorrhage is evidently due to tem-

porary hyperæmia, forced flexion of the joint above and nearest to the wound, will often arrest it. The part must be flexed beyond the normal degree, and held so by bandaging. It will only be a safe procedure in exceptional cases, as the pain will be too severe to admit of long retention, and the vitality of the part would also be jeopardized. Firm compress and bandage may likewise be used in similar cases, but when the vessel is deeply situated, or the individual is unusually corpulent or muscular, it may prove inefficacious.

The hæmorrhage having been arrested, the next step is to thoroughly *cleanse the wound*, at once to put the parts in the best position for prompt healing, and to lessen the liability to suppuration or inflammation. All foreign material that can be seen, clots of blood, grit, etc., are to be picked off with the forceps, being very careful to use no rough or harsh handling. All manifestly dead tissue, from burns or bruises, particularly if partially detached, must also be removed with the forceps, and scissors if necessary—as lessening the danger of suppuration, and also materially increasing the rapidity of repair. When everything of this nature has been removed, allow warm water to drip over the cut parts from a sponge, taking care not to rub the raw surfaces. When all foreign material that can be detected has been removed, and bleeding has ceased entirely, if the parts are covered with hair, whether thickly or otherwise, the skin should be shaved for some distance around the wound. This will not only much facilitate the dressing and redressing of the wound, but lessen the danger of septic poisoning, or erysipelas, by the retention and decomposition of the secretions in the hair. The shaving must be *close*, however, otherwise the short hairs may irritate the wound and delay union.

The wound is now to be closed, and finally dressed. When

of any depth, or length, so that the edges gape considerably, it is necessary to employ sutures, or stitches, of various kinds, with some additional support from adhesive strips. When smaller, strips of plaster alone, or Collodion, will be all that is needed.

Sutures are of two general kinds, the dry and the wet. The former is made by attaching a strip of adhesive plaster to the integument on each side of the wound, passing the stitches through the edges of them instead of through the tissues. It is a method little used, and one that can never, I think, come into common use, as nothing is gained above what can be secured by ordinary adhesive strips. The *wet suture* is made by passing the stitches through the tissues, and the various methods, either to be preferred under peculiar circumstance, known as the continuous, interrupted, or quilled. Either silk, wire, or cat-gut, can be used, as the surgeon may prefer, or the exigency of the case demands.

The *continued suture*, is used in closing wounds of the in-

FIG. 21.

testines, chiefly, and is made as follows: The edges of the wound being held together, the needle is entered abont half an inch from the margin, carried directly through, emerging on the opposite side; the needle is entered again, on the opposite side, carried across in the same manner, thus making an overhanded stitch (see fig. 21). The free ends of the suture are fastened to the nearest stitch.

The *interrupted suture* is that more commonly employed, and is made as follows: The wound being closed, the needle is entered, as in the last mentioned, carried directly across the wound, emerging opposite the point of entrance, and about the same distance from the margin. The thread is then tied, or the wire twisted, and cut off. A number of stitches are taken, from an inch to two inches apart, depending upon the size of the wound.

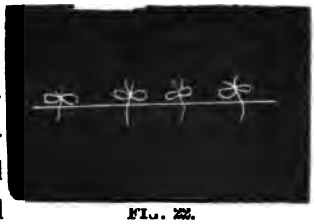


FIG. 22.

The *quilled suture* is used to close *deep* wounds, where it is essential to bring the sides of the wound in close opposition throughout their depth. Cut two pieces of an elastic bougie, or some suitable article, the length of the wound, or a little over. Thread the needle with a double suture, and make a stitch, as in the interrupted suture. Without tying it, cut the suture long, leaving it in position. When all the stitches have been passed, pass one of the pieces of bougie through the loops on one side, formed by the double suture—or if they have been cut, knot them over the bougie; draw the sutures tight, on the other side, and knot them over the second piece, as seen in fig. 23. The stitches must be taken deeply, and can be drawn very tight, the pieces of bougie so distributing the pressure that there is little danger of devitalization.

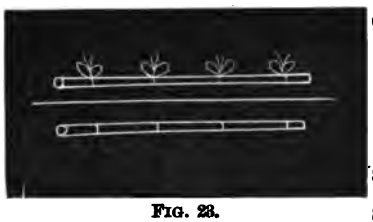


FIG. 23.

Hare-lip pins are sometimes used, instead of quilled sutures. The pin is entered about half an inch from the margin of the wound, and emerges about the same distance from the margin on the opposite side. Silk may be passed around both ends of

the pin, in a figure of eight (Fig. 24-a), or a rubber ring (b), which may be crossed if not sufficiently tight. The ends of the pin are then to be cut off with pliers, and a small piece of cotton, lint, or isinglass plaster placed under the cut ends to avoid irritation of the skin.

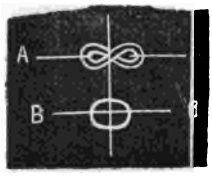


FIG. 24.

Serres-fine, small, broad-pointed, spring forceps—are somewhat commonly used, in Europe, in place of sutures. They are rarely employed in this country, and really possesses no advantages over sutures of the ordinary form.

The length of time which sutures may be allowed to remain, depends somewhat upon their character, the nature of the wound, and the object sought to be obtained. Cat-gut, or sutures of animal fibre, may remain indefinitely; so also with wire. Silk, or hemp, must be removed in from four to eight days, as suppuration may be set up by their longer retention, and the union of the wound prejudiced. Hare-lip pins, like metalic sutures, may be allowed to remain for an indefinite period, but when union is fairly advanced there can be no good result from their longer retention.

Having cleansed the wound, and applied the necessary sutures, the next step is to support the stitches with *adhesive strips*, or they may be used alone, without sutures, when the wound is shallow and of small extent. The plaster is cut into narrow strips, from a quarter of an inch to an inch in width, and varying in length from two to three inches, to six or more, depending upon the size of the wound. They are designed to support the sutures, when used in combination with them, as the traction of the integument has a tendency to loosen the stitches, by a sort of ulcerative process. One end of the plaster is applied to the integument, or the most

dependent portion, or the edges of the wound farthest from the surgeon, the edges of the wound closely pressed together, and the other extremity of the strip drawn tight and smoothed on. If the plaster will not lie perfectly smooth, owing to some irregularity in the surface, it should be nicked with the scissors sufficiently, as at B, Fig. 25. When three or more strips are to be applied, the centre one should be put in position first. The strips may be allowed to remain as long as they fulfil their function, and should be removed as soon as they become loosened or much soiled with the discharges.

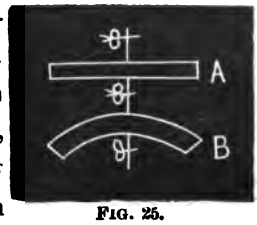


FIG. 25.

In removing adhesive strips great care must be had to avoid disturbing the edges of the wound, or breaking up the adhesions. For this purpose one end should be detached at a time, and stripped up to the edge of the wound; when both have been so loosened, join them together, and lift the strip off directly upwards. When the wound is large it is better to remove one at a time, and apply a fresh one before touching another.

FIG. 26.

Bandaging for the purpose of supporting the dressings, or even to close some wounds without other aid—is an essential feature in the treatments of wounds, and will be fully described in future chapters.

Antiseptic dressings, are those designed to prevent septic poisoning, and are made in various ways. It is impossible to account for their action, on physiological grounds, there being as many theories as there are agents. It is generally

believed, however, that the most prominent effect is to lessen cell-proliferation, or in some way reduce the functional activity of the part. This view would seem to receive confirmation from the fact that the free use of such agents appears to retard the healing process; my experience, I think, will positively prove this in the case of Carbolic acid, at least. The dressings may be medicated with common Charcoal, Cosmoline, Vasseline, Labaraque's solution of Chloride of Lime, or Carbolic acid. The last is the most commonly used. They may be made into poultices, used in the waters in dressing or redressing, or by treating all the articles of dressing with the desired preparation. In the case of Carbolic acid, at least, this is the common method, and according to the instructions of LISTER, is accomplished as follows: The instruments, sponges, water, and everything used in an operation or dressing a wound, are sponged with a strong solution of Carbolic acid; the wound is likewise sponged, the air being more or less filled. The sutures are soaked in the solution, and the lint, bandages, and even the adhesive strips are similarly treated. This is all done with the hope that organic molecules floating in the air are killed, and devitalized particles of tissue in the wound are rendered harmless probably by arresting decomposition. If my conception of the effect of such agents on the living tissues is correct, *viz.*, that growth is arrested—it can only be very rarely that such treatment would be advisable. I have never practiced it, and with a somewhat extended surgical practice I have never seen the necessity for any such precaution; septic conditions are readily met with appropriate remedies, much more so than can be truthfully claimed, I apprehend, for any other method of so-called antisepsis.

The dressing having been completed, the part must be

placed in as comfortable a *position* as possible, both to prevent pain, or lessen it, and thoroughly relax any muscular tension that might have a tendency to draw the parts asunder. No definite instruction can be given on this point, the position depending altogether on circumstances, and to be determined by the feelings of the patient. It must be remembered that the less pain the more rapid the repair, and something should even be sacrificed, in exceptional cases, to insure perfect ease and quietude, both local and general.

Remedies will not only greatly add to the immunity from pain, but will very materially hasten repair; they should be used in solution, or the water used for dressing the wounds, and given also internally. They are as follows:

Arnica, in all contused wounds, for the purpose of hastening the absorption of effused blood.

Hamamelis, in similar cases when the blood collects in the cellular tissue, and remains fluid.

Calendula, in wounds left to heal by granulation, for the purpose of hastening the process, and diminishing the amount of pus.

Ledum pal., when the wound is punctured, little bleeding or effusion, and the parts are very cold.

Hypericum, to allay pain and irritation from the division of nerves. I have fallen into the habit of administering this remedy in *all* cases, after operations, and find its action in subduing pain something almost marvelous.

Other remedies may be needed, in some instances, for which consult other volumes in this series, particularly "accidents."

The question now arises, how often shall we dress wounds, and how long should the first dressings be allowed to remain? The first dressings should not be disturbed until they become

soiled, loosened, or the patient feels uncomfortable in them; if the wound should have discharged freely, either pus or blood, the dressings should be partially removed in about twenty-four hours. It must be done gently, the bandages thoroughly soaked with warm water, and every precaution taken to avoid giving pain, or handling the parts with roughness that might break up adhesions. When the bandages and lint have been removed, the adhesive strips must be inspected, and not removed unless loosened or much soiled. The parts must then be thoroughly cleaned, and the bandages replaced—*Bandages soiled with pus or blood must be burnt;* they should *never* be used a second time.

INCISIONS.—It is of the first importance that the young surgeon should acquire ease and dexterity in the use of his knife. For this purpose he should embrace every opportunity to practice on the *cadaver*, until the various positions of the hand, necessary in different cases, are easily assumed, and confidence is felt in the ability to control the movements of this fundamental instrument. In the majority of instances one of the following positions will be the most easy and natural, but circumstances may arise that will compel the operator to modify them to meet the emergency in peculiar cases. The positions are those given by SMITH (*Operative Surgery*, I, p. 42), and are designated by the French as first, second, third, etc.

First position.—This is made (see figure), by holding the knife as a carving knife, the fore-finger resting on the back of the blade. It is used when deep or free incisions are made, but must not be used too frequently, by beginners, unless they are very familiar with mechanical processes. It might be called the "free-hand" method.

Second position.—In this, the portion to be incised is

pinched up, with the forceps or fingers of the other hand, transfixed by the bistoury, and the section made by cutting outwards. It is the common method of making the cutaneous incision in operations for tumors, hernia, or the like.

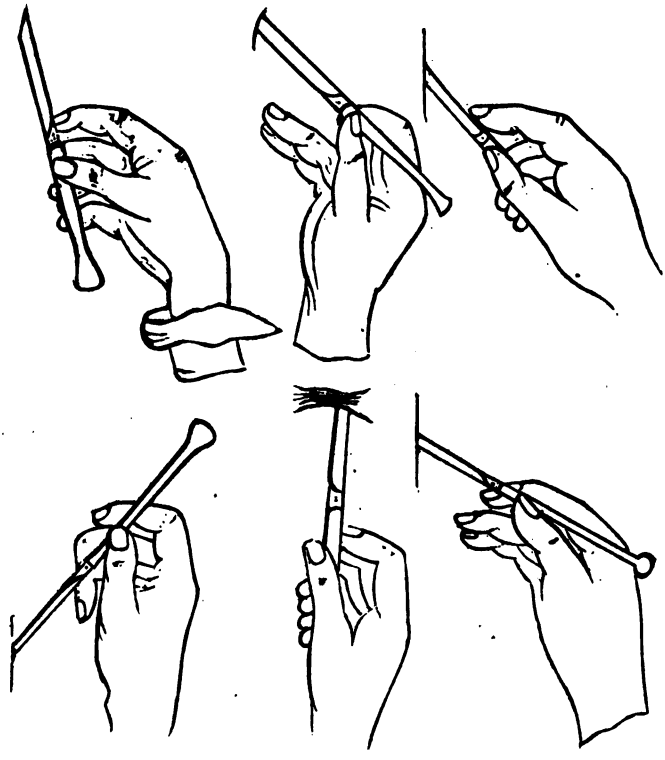


FIG. 37.

It is rarely made with the scalpel, the curved or straight bistoury being preferable, chiefly as it is more pointed, and requires less effort to force it through the integument, which also inflicts less injury in the parts, all bruising being avoided.

Third method.—This is the common position in dissecting, as it gives more control over the knife. The third and fourth fingers rest on the part being operated on, and the incisions

made by flexing the fingers holding the knife. The ordinary manner of holding a pen is the proper position.

Fourth position.—The position of the fingers, in this position, is similar to the above, but the direction of the edge of the knife is reversed; the edge is turned away from the surgeon. It is chiefly used to extend an incision that has been found too limited.

Fifth position.—This is useful in making light motions of the scalpel, or in dividing small shreds of fascia, or incisions running at right angles to those made directly to or from the surgeon.

Sixth position.—This incision is employed in slitting up sinuses on a director. The edge is directed to the palm of the hand.

The accomplished surgeon should make these various incisions with ease, changing the position of the knife and hand quickly and without apparent effort.

In *dissecting*, on the dead subject, we are instructed to direct the edge of the scalpel away from the tissue we wish to expose. In operations on the living subject, this rule is partially reversed. If we direct the edge of the knife to the skin, we nick and injure it so that its vitality is impaired, and an operation may fail, by destruction of the parts so injured, or at least much unnecessary disfigurement ensue—keep the edge of the knife *away* from the skin, and at the same time do not injure the deeper parts. To accomplish these ends, when the attachments are not dense, either use a dull knife, or break up the adhesion with the handle of the scalpel. When this cannot be done, use the knife carefully; constant practice with this end in view, will confer dexterity, and the good operator can seperate tissues most intimately joined together without injuring either.

Incisions are made in a variety of forms, but all of them require certain general consideration. They are linear (1),

FIG. 28.

crucial (2), crescentic (3), eliptic (4), H, V, T, or L, (5, 6, 7, 8). Care must be had to have the incision extend to the same depth through the tissues, and thus the knife is to be inserted perpendicularly to the desired depth, and sinking the edge to the surface, drawing it *at one motion* for the desired extent, and then elevating the handle again withdrawing it perpendicularly. All scratching motions must be avoided; the incision made with a firm hand, completing it, if possible, with one motion. In lancing a felon, or abscess, determine the depth it is desired to carry the incision, and grasping the blade of the knife, between the thumb and finger, the edge directed from you, leave enough of the point exposed to extend to the desired depth; with a single motion force the knife in, and complete the section by depressing the handle, allowing the point "to cut its way out." The knife for this purpose must have a thin blade, and if sharp on both sides the pain will be much less severe. Some surgeons prefer a proper abscess knife, of their own pattern; others a curved bistoury; others, again, an ordinary scalpel. In my own practice, when the depth of the abscess is not extensive, I much prefer the ordinary thumb lancet.

PART SIXTH.

BANDAGING IN GENERAL.

Bandages being used for various purposes, as for making compression, retaining dressings, or to protect from irritation, the mode of application varies with the object sought to be attained. The general principles, however, are the same in all methods, and may be said to be smoothness of application, equalization of pressure, and security from displacement. The application of a bandage, in some of the details, varies with the part, and we shall be compelled to devote a separate chapter to each anatomical region. At this place we will simply allude to the general principles of bandaging, which will avoid frequent repetition elsewhere.

COMPRESSING BANDAGES, are either circular or spiral; the former intended to exercise compression on limited surfaces, the latter those more extensive.

Circular bandages are applied as follows: Take the roller in the right hand, with about six inches of the initial extremity unwound, the free end directed to the left, the body of the roller uppermost. Place the initial extremity on the part to be bandaged, and pass successive turns drawn tightly from left to right, exactly covering each other, until the desired number of turns are passed or the necessary compression secured. The bandage is then torn, the end neatly folded in, and secured by inserting a pin, with the head towards the free end (or

FIG. 29.

right), a stitch with needle and thread, or a small strip of adhesive plaster.

SPIRAL BANDAGES are of two kinds, those with reverse turns, and those without. The latter are made as follows:

FIG. 30.

Commencing at the lower end of the limb, or that nearest to the surgeon, apply the roller smoothly up the limb, in a spiral manner, each turn to be so made that when drawn tightly it will be perfectly smooth. When these turns have been continued high enough, make similar turns, crossing the others, to the point of beginning. This leaves diamond-shaped spaces between the turns of the bandaging. Repeat this process, up and down the limb, drawing each turn tight and smooth, until all the spaces are filled, and the integument completely covered. Fasten the end as usual. Such a bandage is rarely used, the extreme compression for which it is designed, rarely being necessary, and the amount of material needed being double or three times that used by other methods.

The spiral bandage, with reversed turns, is the common form, and is applicable for all varieties of dressing. It is applied as follows: Supposing a leg to be bandaged, apply the initial extremity to the dorsum of the foot, so as to slightly overlap the toes, and fasten the end with a couple of circular turns. Continue the turns up the leg, from left to right, taking care that each turn of the roller overlaps the preceding for about one-third of its width. When the

small of the calf is reached, or sooner, it will be found that to enable the turns to lie perfectly smooth, the roller will be directed so far up the limb that the turns will not overlap, and the integument will be exposed. It is now necessary to make what is called a "reverse turn." Keeping the bandage drawn tight, place the forefinger of the left hand on the lower edge of the bandage, by slightly remitting the tension, then rotate the body of the roller towards you, and thus make a turn in the bandage (fig. 31). *After passing the bandage around the limb*, the turn may be drawn tight, and smoothed down with the left hand. These reverse turns are to be continued as long as the turns will not overlap, making them in a straight line, as in the figure (31). If it is wished to strengthen the bandage by continuing it back to the point of starting, the reverse turns are to be made by reversing the preceding, *i. e.*, turning the bandage *up* instead of down. It will require much practice to make reverse turns quickly and neatly, and every opportunity should be embraced to acquire the requisite skill. The slightest wrinkle, or failure to "break joints" with the turns, indicates failure, and another attempt must be made.

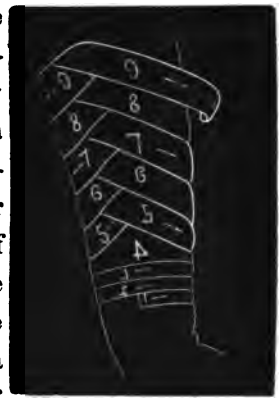


FIG. 31.

RECURRENT BANDAGES, are applied to free extremities, as a stump after amputation, and are made as follows: Place the initial end of the roller on the side of the part to be bandaged, having it held in position by an assistant; carry a turn half around the part, to a corresponding point on the opposite side, having it held by an assistant, or the other

hand of the same assistant. Carry it back to the side of beginning, by folding the bandage over, having the turn overlap the other at least half its width, or a little more; and so

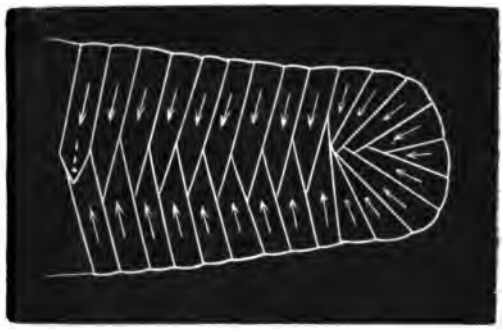


FIG. 32.

continuing the recurrent turns until the whole face of the stump is covered. Next secure the ends and folds, as held by the assistant, by passing the roller, in a circular manner around the limb, over the ends, and securing with a pin, as in fig. 32.

With the single headed roller, these four methods of bandaging, modified by the part to be bandaged, comprise the whole subject. Compound, and double-headed rollers, will need attention later. As most of the dressings in surgical practice are made with the simple roller, however, the student should spend much time in practicing the methods of application given above.

Unequal pressure will often defeat the aim of the surgeon, by forming obstructions of the circulation in the part, and may even establish gangrene. Great precaution must be had, therefore, to apply the bandage smoothly, reverse turns smooth, and see that knots in the warp of the material or the selvage edge are all removed. The roller must never be wet, to make it lie smoother, and never forcibly *stretched* to overcome any tendency to wrinkle. When a perfectly smooth turn

will not cover in the skin, or properly overlap the preceding turn, make reverse turns until it will do so. Unless otherwise indicated, for some exceptional indication, always bandage from below upwards. The degree of tightness must be estimated by a consideration of the object of the bandage, and the probability of subsequent swelling, or the subsidence of an existing tumefaction. In the majority of instances, it is proper to remove some of the inequalities by filling up natural depressions with cotton.

Mau

Part Seventh.

BANDAGES FOR THE HEAD.

Bandages to the head are usually employed for the purpose of retaining dressings, or to protect the parts from injury, when from any cause the cuticle is denuded of epithelium. We have the recurrent; "T" or double "T" bandages; six-tailed, knotted, and two-tailed bandages applicable to the head proper, to the exclusion of the face.

The RECURRENT bandage is applied in one of two ways, usually, although other modifications are occasionally employed. In the first method, the initial extremity is placed on the nape of the neck, the bandage carried across the vertex, folded and returned, and so on until one side has been covered. Then pass one or two circular turns around the head, to confine the ends and cover the other side in the same manner, confining the ends by circular turns as before. In the second method, the bandage starts from the side of the head, immediately above the ear, is carried around the occiput to the opposite side, and by passing backwards and forwards, overlapping as laid down elsewhere—until the last turn is above the supercilliary ridges, when it is continued around the head, as a circular bandage, a number of times sufficient to firmly confine the ends. Neither form can be used indiscriminately, I think, the turns of the bandage running in different directions, the circumstances of a case might readily loosen and derange one, whilst the other would be more secure.

The "T" BANDAGE is used to retain dressings on the scalp, and is made, as shown at Fig. 19, and consists of a band two yards long, and about two inches wide, for the longer strip; the shorter one is of the same width, about half a yard long. In applying it, the shorter strip is laid across the vertex, the initial extremity posteriorly, the opposite end; attached to the longer band, rests on the forehead immediately above the supercilliary ridges. It will make a neater dressing, if the short band is attached to the larger about eighteen inches from one extremity, so that the portion on each side is of different lengths. The shorter end is now passed around the head, confining the occipito-frontal band, and will reach about to the place of starting; the longer end is now passed around the head circularly, the free end of the short band turned up behind, and the bandage completed by expending it in circular turns. The method can be readily comprehended from the accompanying figure (33). A, is the occipito-frontal band; B, the end turned up to be confined with the longer end (D); C, is the short end; D, the long.

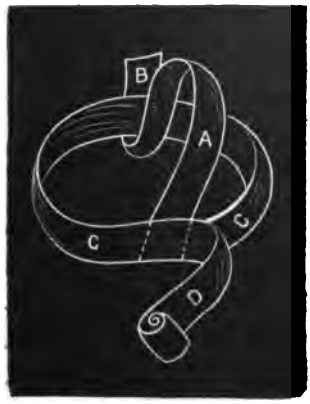


FIG. 33.

The DOUBLE T BANDAGE, for similar purposes to the last, is applied by a modification of it, which will be readily

FIG. 34.

comprehended by reference to the accompanying figure (34). Its uses are the same as the single T.

The TWO-TAILED BANDAGE is made by taking a piece of muslin one yard long and about six inches wide, split into two tails at each side by tearing it up to within two or three inches of the centre. The centre is placed over the dressing to be retained, as on the vertex—the tails crossed, the two anterior tied or pinned at the back of the head, the two posterior tied under the chin. In many particulars it is a better dressing than the recurrent bandage, as it is easily applied, and more secure.

FIG. 35.

The SIX-TAILED BANDAGE, otherwise known as Galens bandage—is a very useful dressing, in some particulars preferable to the above. The muslin, a yard long, and half a

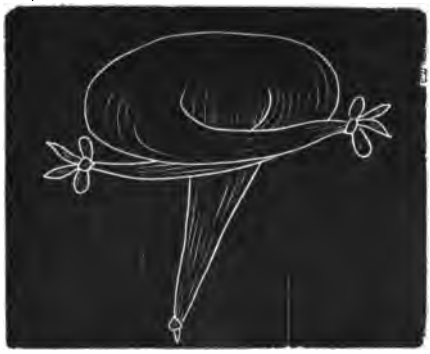


FIG. 36.

yard wide—is torn into three tails at each end, and applied as in the cut. The two centre strips are tied under the chin; the posterior strips on the forehead, and the anterior on the occiput.

The KNOTTED BANDAGE, sometimes used to control hæmorrhage from the temporal artery, or other vessel in the scalp —is made with a compress and double-headed bandage, but is not to be preferred to ligation or other more radical treatment, except as a temporary dressing. It is made by

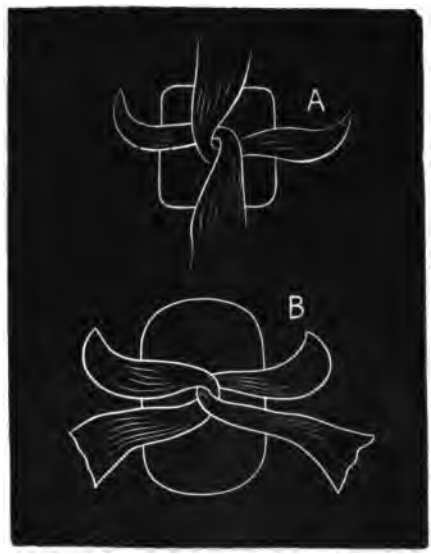


FIG. 37.

placing the compress (a) over the wounded vessel. Apply the centre of the roller to the compress, carry both rollers around the head, crossing on the opposite side—and on reaching the compress again twist them over each other, carrying the lower end over the head, the upper under the chin (A). On reaching the compress again, twist the parts around each other again (B), and carry them around the head, repeating the twists, alternately, until the desired compression has been obtained, or the bandage is expended.

MAYOR'S bandage for the head is very simple, but is not superior to the six or two-tailed bandage. A handkerchief, or piece of muslin of suitable size, is folded by joining the

corners, so as to make a triangle. Place the base of the triangle on the frontal region, and knot the two lateral angles over the posterior, or carry them around the head in opposite directions, tying or otherwise securing them on the forehead. Next fold up the posterior point over the others, and secure it on the vertex.

FIG. 38.

Part Eighth.

BANDAGES FOR THE FACE.

Many bandages for the face may be made by a simple modification of those already noted for the head; in others the ordinary rules for general bandaging may suffice. In a few instances, however, special methods must be employed, a few of which will be given.

Fig. 39.

Mask for the Face.—In cases of burns or other injuries to the face, it may be necessary to cover it from the air. Take a piece of muslin, about four inches wide, and long enough to circle the head, lapping an inch, or enough for a seam. Cut a triangular opening for the nose, in the middle, near the lower edge, and stitch it around the head, as in the figure (39).

Fig. 40.

The circular bandage for the eyes, is made by starting over the right eye (Fig. 40, A), and carrying circular turns around the head, working downwards, until both eyes are covered, then carrying the last turn up over the occiput, across the head and face obliquely (B), under the angle of the

jaw, and repeating the turns until the bandage is expended, or sufficient turns have been made to securely hold the circular turns.

The CROSS OF THE EYES, a more secure dressing, is used for

FIG. 41.

FIG. 42.

the same purpose as the last, *viz.*, the retention of dressings, or for purpose of compression—and is made as follows:

Place a compress over each eye, to fill up the cavity of the orbit. Commence by passing a roller, from below upwards, beginning immediately over the supercilliary ridge, until two or three turns are made. Then take one or two turns obliquely over the occiput, vertex, and face, covering the compress on one side. One or two more circular turns are then taken, to confine the oblique turn, and a similar cross made, in the opposite direction to the last, crossing the remaining compress; a few more circular turns are then taken to confine the whole. The oblique turns may be put on double or triple. A *double cross*, for both eyes, may be made by a modification easily comprehended from the second cut (41).

The DOUBLE T FOR THE NOSE, to confine dressings on the nose, is made by using a double T of narrow bandage, not

more than one inch in width. The circular portion (A) is passed around the head, over the upper lip; one arm of the T is carried up, obliquely, over the bridge of the nose, and passing over the vertex and occiput is knotted or pinned to the circular band behind. The other arm is carried up in the opposite direction, crossing the first on the bridge of the nose, and likewise secured to the circular band behind.

FIG. 43.

FIG. 44.

The NOSE BAG (or sling), may be used in place of the bandage and is made by cutting a piece of muslin, of suitable size, in the form of a triangle, and notching the base, as in the figure. The sides of the notch are then to be stitched together, and tapes attached to the apex (b). The bag may be secured to the face by small adhesive strips, (a), and to the nose by knotting the tapes around the forehead.

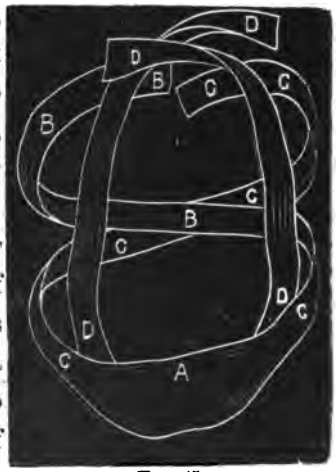


FIG. 45.

The TWO TAILED BANDAGE OF THE CHIN is made with a piece of muslin from four to six inches wide, and a yard to a yard and a half in length. The ends are to be split, to within two inches of the centre; the untorn portion being placed on the point of the chin, the bandage is com-

pleted as follows: The left outside strip is carried around the back of the neck, crossing obliquely upwards over the occiput, and terminates on the right side (B). The right tail (C) joins B on the forehead, when they are secured with a pin, or stitched together. The inside strips (D) are carried directly upwards, and joined on the vertex, and confine all the ends. They may be drawn up through the outside strip on the chin, as in the figure, or carried outside.

All other bandages of the face are either obvious modifications of the above, or of those of the head.

Part Ninth.

BANDAGES FOR THE NECK.

Bandages for the neck are intended to be applied for injuries to this region, but are not necessarily applied directly to the injured surface. Thus, wounds of the neck need dressings that will keep the wound closed, and these can only be applied by attaching them to the shoulders, chest, or back from the head.

The CIRCULAR BANDAGE for the neck is made by commencing low down, on the neck, and passing circular turns around the part, gradually working upwards, until the desired extent has been attained. Great care must be taken to avoid exercising too much compression, as the circulation might be seriously impeded. This bandage is used mainly to retain dressings on the neck.

The POSTERIOR FIGURE OF EIGHT, (head and axilla), is an exceedingly secure bandage, and well conceived to hold the head firmly. It is used in case of transverse wounds of the back of the neck, to hold the edges in apposition; or in burns of the anterior portion, to overcome the tendency to contraction. It is also useful in maintaining the head in one position, for many purposes. The following description, as well as the accompanying cut—is taken with some modifications, from a *Manual of Bandaging*, by LEONARD: Standing at the back of the patient, place the initial end of the bandage at the occiput, 1, and confine by a horizontal turn, 2, about the head. Bend, now, the patients head backward,

and carry the bandage up over the left parietal protuberance, then down across the neck to the right axilla, thus finishing

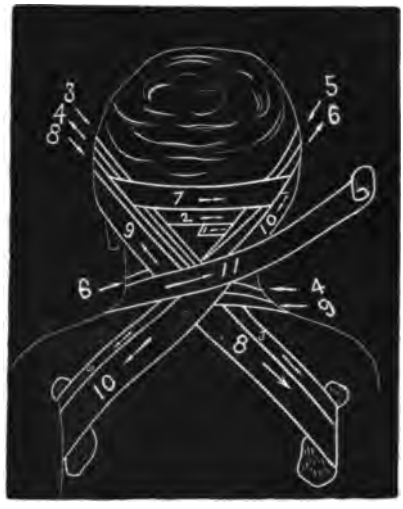


FIG. 46.

turn 3. Then carry the roller head under the arm, up over the front of the right shoulder, over the back of the neck, then to the left parietal protuberance, in line of course 3, thus finishing course 4. Continue the course of the bandage about the forehead, then mount the right parietal eminence, and descend diagonally across the back of the neck to the left axilla, thus finishing course 5. Pass the bandage under the arm, up over the front of the shoulder, over the back of the neck, and remount on the right side of the head, in line with course 5, thus finishing turn 6. Make, then, a complete horizontal circuit of the head, for course 7, coming down over the left parietal eminence to the right axilla for turn 8. Make course 9 similar to course 4; course 10 to course 5; course 11 to course 6, slightly overlapping the preceding turn in each case, and finally exhaust about the forehead and occiput, confining the end as usual.

The ANTERIOR FIGURE OF eight, (*head and axilla*) is used to confine the head inclined forwards in wounds of the throat or burns, and is a very firm and safe bandage. It is applied by reversing the method laid down in the *posterior figure of eight*.

The ANTERIOR DOUBLE "T" OF THE *head and thorax* is occasionally employed for purposes similar to the above, but is not in as general use as the figure of eight. It is a

FIG. 47.

compound bandage, made of a double T of the head, and of a body band encircling the thorax provided with suspenders passing over the shoulders and attached to the band. A corset, or wide band of muslin may be used. A double "T" bandage is prepared, with two tails about eighteen inches long. Between these tails, and running in an opposite direction, another tail a foot long is affixed; the two tails on one side pass down each side of the face to be at-

tached to the body band, near the median line. The remaining or upper tail is directed over the vertex, and confined by circular turns of the body ot the bandage (*a*), when the free end of the vertical band is turned up and confined on the vertex.

THE POSTERIOR DOUBLE "T" is made by a reverse process, and is used for the same purposes as the posterior figure ot eight.

The bandages of MAYOR are exceedingly useful in this region, perhaps more so than in any other part of the body.

The CERVICAL CRAVAT is made by folding a handkerchief of suitable size, into the form of an ordinary cravat; apply the middle of the cravat on the neck in front, carry the ends around completely, and knot them in front like an ordinary cravat. It is designed to take the place of the circular bandage in this region.

The FRONTO-DORSAL cravat is made by using two handkerchiefs. The first is folded and knotted securely around the thorax. The second is folded in the form of a triangle, the base of which is applied to the occipital protuberance, one angle carried up over the vertex and resting on the forehead. The other angles are carried around the head, confining the frontal angle, and carried backwards over the ears, are knotted to the thoracic band. As the lateral angles are brought back, they are securely pinned, or secured, over the ears to prevent their slipping down. This dressing is used for similar purposes to the posterior figure of eight.

The OCCIPITO-STERNAL cravat is the reverse of the above, and is designed to take the place of the anterior figure ot eight.

The PARIETO-AXILLARY cravat is made of two handker-

chiefs. The first is folded in form of a cravat, and knotted around the shoulder towards which the head is to be inclined.

Supposing the head is to be inclined to the left, the second handkerchief is folded in a triangular form, the base of

FIG. 45.

which is to be applied to the left parietal eminence, and one angle carried up over the vertex. The remaining angles are carried around the head, confining the first angle, and carried well above the right parietal eminence, when they cross each other. They are then continued to the place of starting, the head well flexed to the left, and the ends knotted around the axillary band.

This dressing is used in case of burns or wounds of the sides of the neck, and is very secure.

The same object may be attained by a *figure of eight* of the head and axilla, but it will be much less secure and is very easily deranged.

Part Tenth.

BANDAGES FOR THE UPPER EXTREMITY.

The bandages for this region may be classified as follows: For a single finger; all the fingers; fingers and hand; of the hand alone; arm to the elbow; arm to shoulder; arm and shoulder; Mayor's triangles; and the various slings.

(*a*). For a single finger.—A bandage is needed about an inch, or a little less in width, and a yard long. A turn

Fig. 49.

Fig. 50.

or two is taken around the wrist, and thence carried across the back of the hand to the tip of the finger, carried over this, a reverse turn is made around the finger-tip, to confine the reverse and the previous turn. The turns are then made in a circular manner, overlaping half their width, until the

base of the finger is reached, when the roller is carried across the back of the hand to the wrist, and expended in circular turns. It may be confined in the usual way, or by splitting the end for some distance, and tying the tails around the wrist.

(*b*). ALL THE FINGERS.—In cases of burns of the fingers and hands, it is often required that the fingers be separated, so that no adhesions may occur. The form of bandaging usually employed is known as the "*gauntlet*," and is applied as follows: It will require a roller eight yards long and an inch wide. Confine the initial extremity with a few circular turns about the wrist, descending to the tip of the little finger; return, as in the case of the single finger, to the base of the finger, and thence to the wrist again. Make another circular turn at the wrist, and around to the third finger. Each finger and the thumb are to be successively bandaged; after completing the thumb cover the hand by circular turns, ascending to the wrist, where the end is fastened.

(*c*). THE HAND ALONE.—For the purpose of retaining dressings on the hand, it may be necessary to apply a bandage leaving the fingers free. The circular bandage or the demi-gauntlet may be used. The former is made by using a bandage a yard long and an inch in width; commence at the base of the fingers, passing circular turns, gradually ascending, until the wrist is reached, where the end is confined. The *demi-gauntlet* is made as follows:

Confine the initial extremity by a circular turn about the wrist. Carry the roller from the radial side across the back of the hand to the base of the little finger; encircle the finger with a single turn, from outside in, between it and the next finger. The roller then crosses the previous turn, is carried across the palm of the hand to the radial side of the

wrist, up to the third finger in the same manner, across the back of the hand; around the finger, across the back of the

FIG. 51.

FIG. 52.

hand to the ulnar side, across the palm of the hand to the radial side of the wrist again. Again descend to the next finger, and so on, until every finger and thumb has been included, when expand the roller on the wrist, and secure the end.

(*d*). OF THE ARM, TO THE ELBOW.—When the hand is included, this dressing may be a continuation of either of the others, the arm being ascended by reverse turns as necessary, or, as is the common way, as follows;

Extend the arm, the hand being pronated, the fingers extended and close together, and the thumb extended underneath the forefinger. Lay the initial end of the roller in the palm of the hand, directing the patient to hold it with

the thumb; carry the turn over the ends of the fingers, make a sharp turn, to confine the ends, and cover in the finger and hand by circular turns until the base of the thumb is reached, where one or two reverse turns may be needed to make the turns lie smoothly. Ascend the arm by the ordinary spica method, confining the end, as usual, immediately below the elbow.

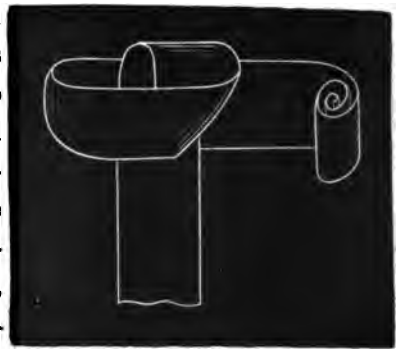


FIG. 53.

(*e*). OF THE ARM TO THE SHOULDER.—Continuing from where the last bandage terminated, the arm being more or less flexed, according to circumstances, the elbow is covered in by a series of figures of eight. When completely covered, the arm is ascended mostly by circular turns, and the

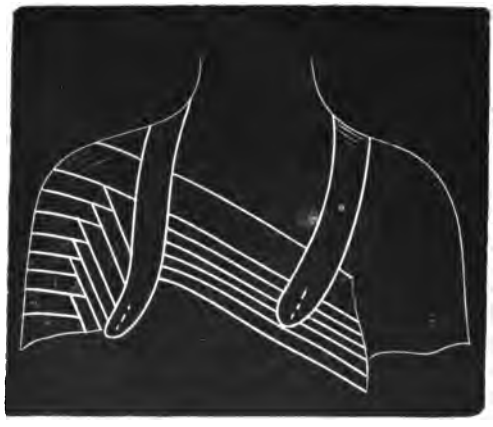


FIG. 54.

end confined, as usual, immediately below the insertion of the deltoid.

(*f*). OF THE ARM AND SHOULDER.—Commencing where the

last bandage terminated, being a continuation of it, the roller is carried by circular turns, close up into the axilla, across the chest to the opposite side; thence under the axilla, ascending the back to the shoulder, which it encirles in a figure of eight, to be then carried back and across, in the same manner, until the shoulder is covered in by successive figures of eight, when the terminal end is to be carried up around the neck, and secured as in the figure (54).

MAYOR'S "triangles" are employed largely in this region to form slings, the most commonly used are as follows:

FOR THE HAND, to retain dressings, is made by applying the base of the triangle on the palmar side of the wrist, drawing the apex over the ends of the fingers, and confining it on the opposite side of the wrist by tying the two angles over it (fig. 55).

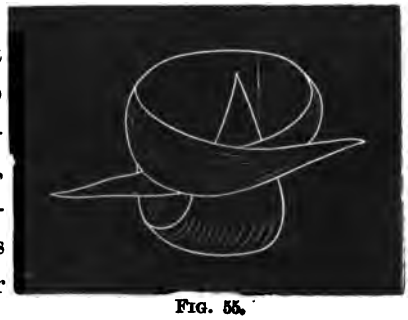


FIG. 55.

In wounds of the wrist it is often necessary to keep the hand in a state of extreme flexion or extension, until healing is well advanced. Proper splints should be employed, but for temporary purposes the following may be used.

EXTENSION (OR FLEXOR) FOR THE HAND, made of three cravats. One is knotted firmly around the arm, above the elbow; another around the hand, excluding the thumb. The third is passed from one to the other, on the outer or inner face of the arm (as flexion or extension is desired), and knotted firmly (fig. 56).

A *sling for the arm* may be made in one of three ways.

(*a*). Knot a handkerchief loosely about the neck. Form

another triangle; the base is placed under the hand, the two tails being knotted to the cervical cravat (fig. 57)·

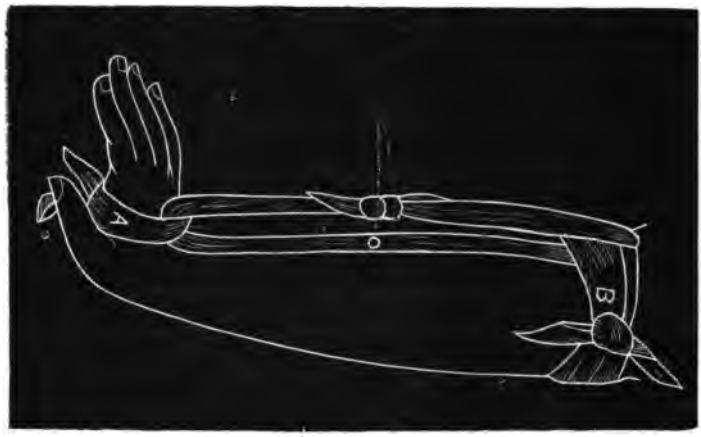


FIG 56.

(*b*). Fold a large triangle, say sixty inches on the base, and twenty-four in height. Flex the arm across the chest with the fingers extended. Place the centre of the base

FIG. 57.

under the fingers, and carry one angle up under the axilla, across the back to the opposite shoulder, where it meets the other angle, and both are knotted together. The apex is

brought forward over the elbow and securely pinned (fig. 58).

FIG. 49.

(*c*). With a smaller triangle place the base under the finger, the apex only extending to the elbow. Knot the angles of the base around the neck.

A simple sling may be made as illustrated by fig. 59.

One of the best slings for the arm I have ever used, is

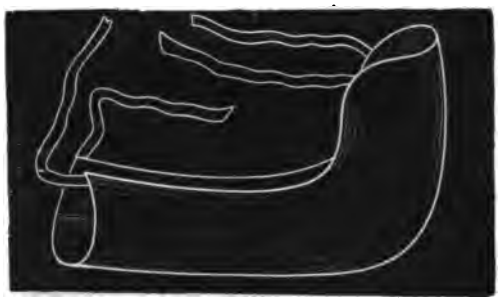


FIG. 60.

made from a long legged stocking. By cutting it up on the anterior border, and attaching tapes to each angle, the arm is better supported and more securely held than by any dressing, for a similar purpose, with which I am acquainted.

Part Eleventh.

BANDAGES FOR THE TRUNK.

The trunk will often require bandaging for fracture of the ribs, for emphysema, perhaps for dropsy; and the mammæ will need supporting bandages in mastitis, hypertrophy, and some forms of tumor.

Spiral of the chest.—Drop about a yard of the bandages over the left shoulder, in front. Carry the roller down the

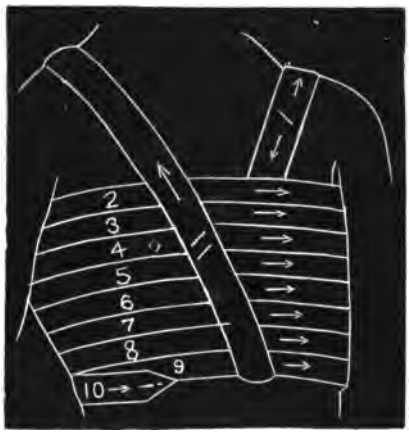


Fig. 61.

back, diagonally to the right axilla, whence make the first turn about the chest (2). Continue these turns, working downwards, until a sufficient number have been taken, each turn overlapping about one-half of the preceding, and fasten the end as usual (7). Next take the free end (8), carry it up over the turns to the right shoulder, and secure it to the turns on the back. This has the effect to counteract the

tendency to slip down which would otherwise prove very annoying. The roller should be about nine yards long, and two inches in width. By increasing the length of the roller the bandage may be extended downwards over the abdomen.

CIRCULAR BANDAGE OF THE THORAX.—Take a piece of muslin about six inches in width, and long enough to encircle the chest two or more times; secure it firmly by pins or stitches.

FIG. 62.

Then take a folded cravat or handkerchief, folded cravat fashion, place the centre on the nape of the neck, and attach each end to the body bandage in front by pins.

In the case of woman, particularly those with large mammæ, the chest should be well padded with cotton, to protect the breasts from the injurious effects of pressure.

CROSS OF ONE BREAST.—When well applied this form of bandage is useful to support the mammæ, but it is liable to become deranged, and is not to be preferred to some one of the simple slings to be given shortly. The roller should be eight yards long and two inches in width. Confine the initial end by a few circular turns around the chest from below upwards. Then carry the roller up over the chest, between

the mammæ, nearest the sound side; take it over the shoulder, and diagonally across the back, and make another circular

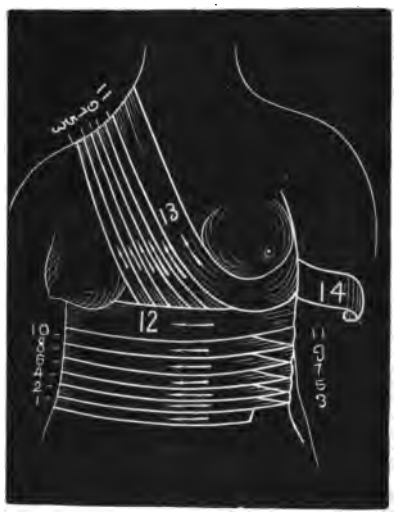


FIG. 63.

turn. Again ascend the chest, nearest the diseased side, overlapping the former ascending turn, and descend the back for another circular turn about the body. Continue these turns until the mammæ is covered in, well-supported, or the bandage is exhausted. It will require pins or stitches at all the cross turns, as the turns cannot be drawn very tight—to prevent the bandage from becoming disarranged, and not only give the patient much annoyance, but often defeat the object for which it was applied.

CROSS OF BOTH BREASTS.—The roller should be at least twelve yards in length, by two inches in breadth. It is a much more secure dressing than the former. Confine the initial extremity at a point about midway between the sternum and the umbilicus, by a few circular turns from left to right. Carry the roller then up over the front of the chest, between the breasts, nearest the left one; down across the left

shoulder and back, another circular turn, mounting the back of the right shoulder, carrying the turn across the chest to

FIG. 64.

the left side, whence make another circular turn. Continue these turns until both breasts are equally supported, or the bandage expended.

SLINGS FOR THE BREAST.—Slings may be made in three ways; the single cravat, double cravat, and the bourse.

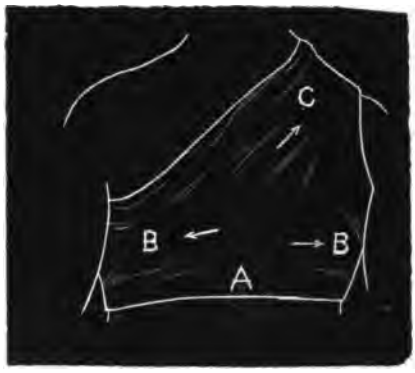


FIG. 65.

(a). The *single cravat* is made by folding a cloth into a triangle of proper size, say with a base a yard long. Place the centre of the base between the mammæ, and, if the left breast is to be supported, carry the upper angle around the right side

of the neck, the lower around the left side of the chest, underneath the breast, and knot them together on the back. The apex is now taken over the left shoulder and knotted to the others.

(b). The *bourse* is made as follows (LEONARD *Bandaging*, p. 79): A piece of linin, ten inches in length and eight

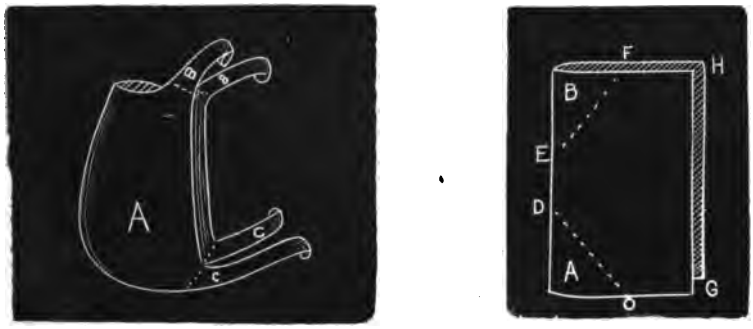


FIG. 66.

inches in width when folded at the centre. Cut then the folded corner A and B off by the dotted lines c-d and e-f. Stitch then the whole together, from G to F. This done, to each of the two corners at G, and the two at H, (b), stitch a narrow strip sufficiently long to meet and tie, with its fellows, (the two inferior) about the body, and (the two superior) about the neck."

PART TWELFTH.

BANDAGES FOR THE LOWER EXTREMITY.

The bandages for the inferior extremities have a certain relation to those of the superior, making due allowance for the different form of the ankle as compared to the wrist. They may be arranged, therefore, into those including the feet alone, those extending to the knee; those including the knee; those extending to the hip, and those in which the hip is covered in. In this connection it is proper to include, also, slings applicable to this region.

FOR THE FOOT.—We have in this region, three forms of bandage, each of which is employed to fill certain requirements.

(*a*). The *circular of the foot* is made by applying the initial extremity of the roller at the base of the toes, and passing the turns, in a circular manner, from left to right, until a sufficient portion of the foot is covered, and the end is secured as usual.

(*b*). The *demi-gauntlet* is applied somewhat as in the case of the hand. Confine the initial extremity of a narrow roller around the ankle, immediately over or below the malleoli, by two or three turns from left to right. Carry the roller across the dorsum of the foot to the outside of the little toe, carry it under and around this, and between the toes, thence up to a point below the left malleolus, take a circular turn and repeat the former turn, encircling the third toe in the same manner. As the natural position of the foot is nearly

at right angles to the leg, it will be necessary to make the circular turns as low down on the leg as possible, to secure a smooth, even bandage.

(*c*). The whole foot, with the toes, may be bandaged, either by making the *complete gauntlet*, modified as in the former, or an ordinary spiral bandage, as in the case of the hand, shown at fig. 51

LEG TO THE KNEE.—The foot is to be covered in by either method—probably the last being the best. When the circular turns refuse to lie smoothly, the roller must be carried in a figure of eight around the ankle, repeating the turns, slightly overlapping each time, until the ankle and heel are covered. Up to this point no reverse turns must be made if it is possible to avoid them. After the heel and ankle are fully covered, ascend the leg in the ordinary spiral manner, making reverse turns as they are needed, and confine the whole by circular turns below the knee,

INCLUDING THE KNEE.—Upon reaching the tibial attachment of the ligament of the patella, the leg is to be placed in the desired position, and covered in by figure of eight turns, as in the case of the ankle. When covered completely, ascend the thigh, as high as is desired, by spiral reversed turns, and confine as usual. It is occasionally necessary to bandage the knee alone, either to retain dressings or to exercise compression. Apply the initial extremity of the bandage, immediately above the patella, confine it by one or two circular turns, and cover in the knee with figure of eight turns; when complete, pass one or two circular turns above or below, and fasten as usual.

INCLUDING THE HIP.—Upon reaching the trochanters, one or two circular turns are to be taken to give additional security to the dressings, and the hip is covered in by successive fig-

ures of eight turns, carried around the opposite hip, the

FIG. 67.

whole being secured and confined by a few circular turns about the body.

Should it be desired to apply a bandage to the hip alone, it may be done as follows: Secure the initial extremity by a few circular turns about the body from left to right, when the left hip is to be bandaged, or from right to left for the right hip. Carry the roller over the abdomen to the thigh, below the trochanter, bringing it around through the groin over the thigh again, thus crossing the former turn, up over the back to the point of starting. Here make another cir-

cular turn, and repeat. The first turn is the lowest on the thigh, each succeeding turn overlapping the last, gradually ascending until the hip is covered in.

SLINGS FOR THE LOWER EXTREMITY.—It is occasionally necessary to carry the lower extremity in a sling, or to temporarily preserve flexion or extension of the knee or foot. After dressing a fractured leg in an immovable dressing, a sling may be employed to enable the patient to move about on crutches; this is perfectly proper, and the practice is universal. To secure extension or flexion of the foot or knee, however, a splint had better be employed. For mere temporary purposes, a sling may be used, and they may be made as follows:

Flexion of the foot.—Encircle the knee with a cravat, in a figure of eight. Apply a folded cravat circularly around the foot. Connect the two by a connecting band or long cravat, or towel, making tension to the desired extent.

Extension of the foot.—Apply a cravat or bandage circularly on the thigh, and another around the instep of the foot, as in the last method. Make the extension by connecting the two with a band or handkerchief passing down posteriorly. The apparatus may be modified, by substituting a slipper for the band on the foot, removing the heel, and about an inch of the heel-part of the sole. The extending band is attached to the sole of the slipper. This last dressing is often used to maintain extension after operations for talipes.

Slings for the leg, are of two kinds: those extending to the foot, and those to the knee. The first are made by carrying a broad band from the neck to the foot, passing underneath it, and up again to the neck, when the ends are knotted together. It will answer the purpose better if the sling is

confined by a circular band around the waist, as the leg is otherwise allowed to swing too much.

Slings extending to the knee, are usually mere temporary dressings, and are made of two or more towels or cravats, on the system of MAYOR. Supposing the right leg to be the one

FIG. 68.

concerned. A band is placed over the left shoulder, reaching to the right hip. Make a triangle with a base of one yard and a half, and a height of about two feet. Apply the base of the triangle to the leg, as near the ankle as possible, the leg being flexed. Carry the angles up each side of the leg, and knot them into the shoulder band. The apex is then pinned across the front of the leg, preventing the leg from slipping out of the sling.

Here we will dismiss further considerations of bandaging, or temporary dressings, and may state that while very much

more might be included, what has been written will be found to be all that is essential in actual practice. Many manuals on bandaging and minor surgery are filled with methods of bandaging that are never used in practice, seeming to be designed more for the purpose of exercising the student, or showing the ingenuity of the writer.

Part Thirteenth.

PERMANENT DRESSINGS.

In cases of fracture as well as some forms of morbid action, circumstances frequently demand that insecure, movable, or temporary apparatus be replaced by something more permanent in character, permanent in the sense that its use may be continued until the treatment of the case has terminated. These dressings are of two general characters, which may be described under splints, and the application of bandages, stiffened in various ways, which are designed to take the place of the former. The consideration of splints will be withheld for a subsequent chapter.

The use of bandages stiffened by various substances, has recently attracted much attention, but is far from being of modern origin. In some forms the principle was recognized by some of the ancient surgeons, Hippocrates and Galen having employed some preparations of glue, and Avicenna refers to similar procedures. Cooper, as late as 1830, was the first of the more modern surgeons to employ such dressings with any frequency, but it was not until within the last fifteen or twenty years that the practice became at all general.

The material used to stiffen the dressings, is either starch, plaster of Paris, silicate (liquid glass), various mucilages and glues, solutions of rubber and the like, but the choice at present seems to be limited to either starch or gypsum. Each of these articles has earnest advocates; Mr. Erichsen

being the most prominent champion for starch. While such authority is sufficient for many practitioners, I think, in this country at least—gypsum is more commonly used.

Whichever agent is used, the methods of application, as far as the preliminaries are concerned, is as follows: The part to be bandaged is to be placed in the most easy and comfortable position, providing the position does not disarrange fragments, in the case of fracture — or in cases in which anchylosis is threatened or possible, the position is not one that would impair usefulness of the member. The part should also be thoroughly cleansed, and care taken that nothing be left in contact with the integument that would irritate it. All inequalities in the limb are to be filled up with clean cotton batting, and the whole part enveloped in a thin, evenly-disposed layer of the same material. It is my practice to cut strips of binders-board, stiff pasteboard, or even tin — say an inch and a half in width, and long enough to extend the whole length of the member — which are laid on the cotton, about one to each aspect of the part — and temporarily held in position by a piece of tape or string. On applying the bandage these tapes or strings are to be cut and removed as they are reached.

To apply the *starch bandage*, we now proceed as follows: With an ordinary roller bandage, one that has been washed, or made of old muslin or sheeting to be preferred—bandage the limb carefully and smoothly, from the distal extremity as high as may be needed. Secure the end with a strip of adhesive plaster. Have the starch ready mixed, thin enough to "run" easily, and yet not too watery—and kept warm. With a varnish brush or a mop of muslin, paint the bandage already applied thoroughly, covering every part of it with the starch. Now apply another course of bandaging,

in an opposite direction, *i. e.*, from above downwards, covering it with starch in the same manner. This process may be repeated until four, six, or eight thicknesses of bandaging are applied, as may be deemed necessary from a consideration of the accidents to which the part will be exposed, and the strength of the muscles. Two or three layers or thicknesses of bandage may be sufficient, when reinforced by the strips of tin or pasteboard.

To apply the *plaster of Paris* or *gypsum* bandage, we have a choice of three methods:

1. After preparing the part as above, mix plaster of Paris and water, until a consistency equal to a thin batter is attained, which is to be kept in motion by stirring; the quantity mixed, however, should not be large, not more than a teacupful. Apply the bandage as before, and paint the mixture over it, precisely as in the case of the starch bandage. Two or three thicknesses will usually be sufficient. Hardening will usually be very speedy, and in course of half an hour the dressing will be sufficiently firm.

2. The second method is somewhat different, and while that most generally adapted is not in my opinion to be preferred to the first, as a rule. The material for the bandage should be of some coarse material, an open texture, as the coarser varieties of unbleached muslin, without siezing. The plaster is rubbed into the meshes of the bandage, dry; care being taken to have it well filled. Apply the bandage as usual, and as each layer or course is completed, wet it with a sponge or brush. Continue the bandaging in successive layers, until the desired thickness or strength has been attained, when cover in the whole with an ordinary roller.

3. The third method is occasionally very useful, and is the only form of the many-tailed bandage of SCULTETUS

that is at all useful or practicable. It is made by cutting a number of short pieces of bandage of a suitable width, into lengths equal to one and one-third the circumference of the part. The plaster, mixed to a consistency of thin batter, is prepared in a tin basin. The strips are dipped into the mixture and immediately applied; each strip to overlap the preceding about one-half its width, and made lie smoothly by pressing with the hand. As many thicknesses may be applied as is desirable and needed.

No matter what the agent may be that is employed to give solidity to the dressings, it will be necessary to keep the member immovable until the dressings have attained the requisite degree of solidity. This will require from ten to twelve hours in the case of starch, to from half an hour to an hour in the case of plaster. I am not partial to splints, for this purpose, as they may exercise injurious compression on the plastic material. Long narrow bags filled with sand or bran is much to be preferred; they may be simply laid in contact with the parts, one on each side, and will be found to perfectly control muscular motion.

In the case of a wound or an ulcer, in the part to which the dressing is applied, as in the case of compound fracture, the bandage may be cut while soft, so as to make a trap (Fig. 69), which will readily permit an easy inspection of the parts, as well as an opportunity for the application of topical remedies. Furthermore, the annoyance and danger that would attend a retention of the discharges will be avoided.

FIG. 69.

Should the part swell to an extent to cause discomfort or endanger the life of the part; or should a pre-

viously existing swelling diminish to such an extent that the bandage ceases to fulfill its indications, it must be opened and the fault corrected. For this purpose the anterior surface of the dressing must be divided throughout its whole extent, down to the layer of cotton batting, by means of strong cutting pliers. The part may then be encircled by tapes, permitting the bandage to be loosened when too tight, or tightened by overlapping, when too loose. In place of tapes it is neater, and more efficacious to apply a roller over all.

It is a question of some interest, when to apply the bandage, in acute cases, before or after swelling, *i. e.*, primary or secondary. It is asserted that the pain caused by the swelling of a fractured limb after the application of a permanent dressing, is very great; that the swelling also necessitates an early derangement of the bandage, and nothing is practically gained by pursuing the practice. This is quite true, and the objections are valid. On the other hand, it is held that a secondary dressing, that is after the subsidence of swelling, exposes the sufferer to danger of displacement of the fragments it is true, but care and watchfulness will prevent this, and there is no danger of pain and strangulation of the part. After some considerable experience, and weighing well the arguments on both sides, I have finally made it a practice to apply the dressings primarily, and think the early opening on account of swelling is advantageous, as it permits a daily inspection of the part, and the preservation of the requisite support by varying the compression as the swelling augments or subsides. As will be seen elsewhere (*Accidents and Emergencies*), the extension method of Buck is used for the first few days, in cases of fracture, followed by the application of the permanent dressing as soon as the more violent local symptoms have abated.

After a time varying from a week to a fortnight—depending somewhat upon the excellence of the apparatus, or the influences to which it has been subjected, the dressings will become more or less broken or pliable, and its usefulness correspondingly impaired. The question will then arise, whether to apply a new dressing, or reinforce the old one with some additional thicknesses. When the shape has been retained, and there are no sharp angles or corners to cause excoriation of the integument, the best practice is to apply one or two additional thicknesses of bandage, over the old dressing, with a few strips of tin or binders-board between them. If the layers are equal in number to the orginal dressing, the part will be too bulky.

Without accident, and as long as the course of the case is satisfactory, the bandage should be retained. In the case of fracture; from six to eight weeks is usually ample time, but the period must be determined solely with reference to the degree of consolidation in the broken bones. Under all circumstances, however whether the case be one of disease or accident, it is better to remove the dressing entirely once or twice a week, and carefully supporting the parts, bathe the integument, and attend to any excoriation that may exist.

This concludes what was intended to include a practical account of bandaging, both temporary and permanent. Very many methods have been intentionally ommitted, as forming for the most part, simply exercises to familiarize the student with the roller and manipulations. In actual practice nothing will be required in addition to what has been given, but should the occasion arise, a modification of the dressing laid down in these pages will be all that is needed. If the practitioner is unable to vary these methods to suit particular cases, he is certainly unfitted for the practice of surgery, and

no amount of additional instruction would make him an expert. Among the omitted bandages will be noted the many-tailed SCULTETUS; the invaginated, for wounds; and one or two that are equally obsolete and useless. I think all surgeons of experience will be found agreed, that such dressings are not only valueless, as compared to others, but are even at times hurtful.

Part Fourteenth.

SPLINTS.

Splints are a species of dressing, used either in the treatment of fractures, or such morbid conditions as seem to demand the retention of immobility in the part. They are made of various material and of many shapes, intended to be more or less adapted to the form and contour of the parts, and of sufficient firmness to fulfill the indications. From the earliest times splints have been employed in the dressing of fractures and dislocations particularly, and it is only recently, within twenty-five years—that less importance has been attached to their employment. Many surgeons of experience have entirely discarded them; others use them occasionally, in exceptional cases; and still others only employ them as a primary dressing, applying some one of the immovable dressings after the subsidence of the more acute symptoms. The sole advantage in the splint dressings, is the absolute immobility secured when they are of proper construction and well-applied. The disadvantages are numerous; some of them easily recognized, while others are still somewhat hypothetical.

It is objected to the use of splints, particularly when applied to the lower extremity, that they compel prolonged confinement, by which the general health of the patient will suffer more or less, and convalescence will be unnecessarily prolonged, and the full restoration of function in the part will be delayed. Indeed there are cases noted in which a limb has never regained its function fully, from the

changes induced in the muscles and structures of the joint by long maintenance in one position. It is also objected, that the inability to change the position of the injured member, causes unnecessary suffering and inconvenience, and to a considerable extent prolongs the treatment. That the splints do add, very much, to the painful jerking and twitching of the muscles, none can deny, and many are of the opinion that they are chiefly provocative of the symptoms. At all events, it must be apparent to the most careless observer, that when a strong vigorous man sustains a fracture of the leg, and is at once bound up in unyielding dressings, and all motion, even the most trivial, rendered impossible in the part, the consequences must be more or less serious, and even without positive suffering the unusual confinement, local and general, must be prejudicial. Whatever may be claimed, therefore, for the value of splints as a continuous dressing, in fractures at least—is more than counterbalanced by the objections briefly alluded to above.

From my own experience, which has been somewhat extensive—I am impelled to lay down the following rule: As a *primary* dressing solely, splints may be used when circumstances are not favorable to the "American method" of extension, but they must be removed, and the plaster dressing applied, as soon as the primary swelling and inflammation commences to abate.

Having determined the question of when and under what circumstances the splint should be applied, it remains to make a selection of the kind or variety of splint to be employed, and to consider the manner of application.

Splints are of two general kinds: Patent, or moulded, and improvised. The former are made of various kinds of wood, tin, wire, or gutta-percha, and are manufactured in so

many forms, and for such a variety of purposes, that it would be literally impossible to notice them fully unless a volume were devoted to the purpose. Apart from the space required, I think most surgeons of experience will agree with me—the study would be profitless, as they may be one and all condemned as either positively hurtful, or useless; useless, as far as they may be supposed to possess any value over the improvised dressings familiar to all practitioners. In some conditions, as hip-disease—special splints *may* be needed; but even under such circumstances, I think the best results are obtained from the ordinary improvised apparatus. One obvious reason for this is, that the conditions are continually changing, either through wasting or swelling of the part, or increasing or diminishing deformity, which are more readily met by alterations in the improvised dressing, which the nature of things forbids in the patent or moulded articles. I can say, to the young surgeon, or student, therefore do not waste your money in the purchase of moulded or patent splints; it is an investment that will yield a poor return, and the experienced surgeon will regard your attainments with suspicion when he finds you surrounded by an assortment of these useless appliances.

Improvised splints, may include the following, which will be noticed in the order of their importance, as it appears to me:

1. *Pasteboard* has long been a favorite material, with me, from which to form temporary splints. The method of preparation and application is as follows: After the fracture has been reduced, and the parts ready for the final dressing (*Vide* "*Emergencies*"), the part must be enveloped in cotton batting, applied evenly, and of no great thickness. The sole use of the cotton is to protect the integument from irritation

from the splint, and, under these circumstances, not to fill up depressions or cover protuberances thickly. If it is applied thickly, and the part made to assume a uniform size, the splint will exercise unequal pressure; here too much and there too little. The result will be that the support will be inadequate, some motion of the fragments be allowed, and the circulation may be interrupted sufficiently to endanger the vitality of the part. Next select a strip of stiff pasteboard, or binder's-board—and make it the desired length and width. Do not *cut* it, with knife scissors, or it will leave sharp edges that may do mischief; bend it backwards and forwards, until it separates, and the edges will be soft. Dip it into hot water, soaking it enough to make it soft and plastic, and mould it to the part by gently pressing it into shape with the hands. If well done, and the material has been sufficiently softened, we will now have a perfect cast of the part, and each portion of it will sustain the same degree of compression.

It may be necessary to apply the splint to the shoulder, elbow, jaw, or some region in which an angle is to be covered. The preparation of the splint must be modified, some-

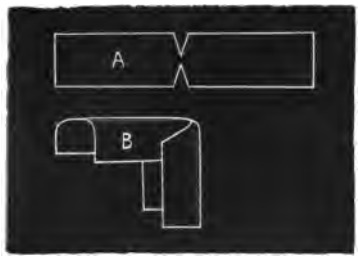


FIG. 70.

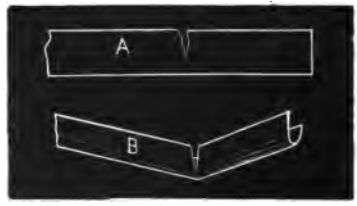


FIG. 71.

what, to meet these special indications. When the angle to be formed by the splint is right-angled, or acute, the strip is to be deeply notched, on each side, quite close to the centre, so that it is almost divided. (*a*). The notched portions are

then to be folded over each other (*b*), and the whole splint moulded into the desired form, as before.

Should the angle required be an obtuse one, as in the case of a partially flexed arm, I have found it to answer better to cut or notch the strip on one side only, and use two pieces to complete the dressing (fig. 71).

The strips having been moulded to the part, are to be held in position by a couple of courses of bandaging, the whole extremity being covered in from the distal extremity to and above the joint above the splint, or as high up as possible. The bandage must be applied smoothly, and with some degree of firmness, so that the splint may be kept in form and shape while drying. In a few hours the bandages may be reapplied, the splint being dry, and the part suspended in a proper sling or laid in an easy position on a pillow.

During the initiatory stage of repair, that is while all foreign material is being absorbed and carried out from between the ends of the bones, the dressings must be undisturbed, except that they must be loosened or tightened as swelling increases or diminishes—but should be finally removed when active repair sets in, say in three or four days—and the plaster dressing applied. In the case of compound fractures, such applications, indeed splints of any kind, I believe, are inadmissible. The extension plan of BUCK'S ("*Emergencies*"), or simply keeping the parts in position by bags of sand or shot, would be far preferable.

2. *Gutta-percha* is a favorite dressing with many practitioners, but there are two objections to it, viz., its comparative expensiveness, and its imperviousness to the air. The latter objection is a serious one, but the dressing being usually merely temporary, is not insurmountable. If all the indications were as well filled as in the case of pasteboard, the dif-

ficulty of procuring the article in sheets, at all times, will permit its general adoption. The method of application is the same as in the case of pasteboard, the degree of heat needed being somewhat greater, and more time being necessary to render it plastic. An objection that I have always met when attempting its use, is that when drying it is liable to warp and twist, and may thus do more damage than good.

3. *Shingle splints* are the typical article, and for a long time have held the first position in the estimation of the general practitioner. They are made of any thin light wood, as cigar-box covers, pieces of shingle, the backing from picture frames, and the like. In general terms they are known as "long" or "short," each variety being subject to many variations in detail, for which consult special fractures in "*Emergencies.*"

The *long splint* is one designed to extend the whole length of a limb, as from the foot to the hip, or even to the axilla; or the hand to the shoulder. They are necessarily made of thicker wood than when designed for application to a less extent, but are straight, in width about the diameter of the part, the length being somewhat greater than the limb for which it is designed. Thus Ferguson's long splint for the lower extremity, is from four and a half to five feet long, de-

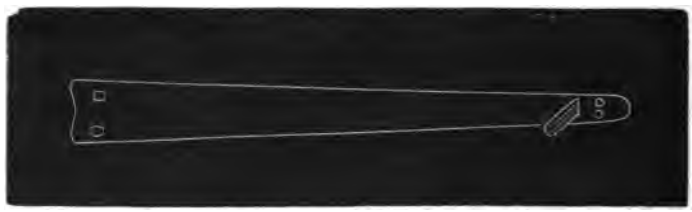


FIG. 72.

signed to reach from the axilla to some six inches below the sole of the foot; they are half an inch in thickness; in width,

they taper from five inches at the upper extremity, to two and a half or three at the lower. They are sometimes provided with a foot-rest, when for the leg—but whether for the leg or arm, two holes are bored in each extremity to receive bands for extension and counter extension.

In preparing the splint for application, cut a piece of muslin the shape of the splint, but greater in all directions by about three inches. With small tacks attach one edge of the muslin to the long edge of the splint, on the under side, when the splint is applied. Next attach the muslin in a similar manner to the foot, and for two or three inches up the other side, not drawing it tightly across. Stuff cotton in firmly, or curled hair, or the like—when full tacking down two or three inches more, and crowding in more filling. Continue this until the whole splint has been well-padded, smoothly and evenly, without knots or projections. When completed, tack the muslin firmly around the holes in the head and foot, and cut it away so that they can be utilized. The splint is now ready for use.

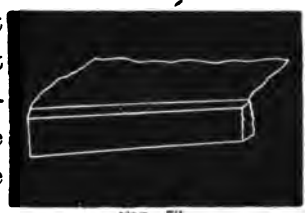


FIG. 73.

FIG. 74.

The *short splint*, is designed to extend only up a portion of an extremity, and is made of much lighter material. For the arm, they are made to extend from the elbow to the shoulder; for the forearm, from the tip of the fingers to the elbow, etc. They are prepared for use by laying on them a thick layer of raw cotton, or cotton batting; place the initial end of a

roller on the under side of the splint at one extremity, carry the roller down under the end, and up over the face, making a reverse turn to carry it around the splint, and by continuing the spiral turns, overlapping at least, one-third at each turn, cover in the whole splint, fastening the end with a pin on the under surface. A reverse turn may be made at the other end, in finishing off, which by passing over the end will give a neater finish to the splint, and serve to better confine the padding. The splint is now ready for application.

Either splint being in use, the mode of application is as follows: After the fracture has been reduced, if of the simple variety (that is without a wound leading down to the bone), lay the splint on the side of the limb which presents the least inequality of surface, as the palmer side of the fore-arm,—and examine the part to see that all parts of the surface are in contact with the splint, so that when the bandage is applied the bone will not be distorted or bent out of shape. All depressions of that kind are to be filled up with raw-cotton, so that the pressure is evenly distributed. In applying the long splint to the leg, the outside of the member must necessarily be selected. After properly adjusting the part, retain the splint in position by two or three courses of bandaging, from below upwards. The tips of the fingers, and the toes also—had better be left uncovered, so that symptoms of strangulation may be early detected, and the proper treatment applied. The limb may then be suspended in a sling, or arranged in a comfortable position on pillows, and remain undisturbed, unless the bandages are loosened on account of swelling—until the time arrives to apply the permanent dressing.

The question is much debated, or has been until very re-

cently—whether a bandage should be applied to the part before the splint is applied or not. I think the weight of testimony is against it. As far as I am able to judge, there are no very obvious advantages in the custom, and certainly some very serious objections. The swelling of the limb will cause less discomfort if there is no bandage under the splint, and should circumstances require loosening of the dressings, it is easier to accomplish it, without disturbing the position of the fragments, than if the splints had to be removed, and the bandage on the part to be cut or otherwise taken off. Without arguing the question further, I will lay it down as a rule, that the splint is to be applied to the naked member.

4. *Leather* splints, in one of two forms, are somewhat extensively used, but do not possess any advantages over the pasteboard or gutta-percha. Indeed they are in every way inferior to either of them. In the first method, strips of sole-leather are applied as gutta-percha or pasteboard, by soaking in hot water until pliable. They can never be softened so that they can be as accurately moulded to the parts as the others, and when dry, are liable to wrinkle more or less. Their lack of perfect adaptability necessitates the use of cotton to fill up inequalities, and this, it is obvious, must, to a very large extent, render the support very unequally distributed. Unless no other material can be obtained, I should never employ the leather.

FIG. 75.

The second form is made as follows: Take a piece of leather, soft and pliable, of a suitable size to completely encircle the part without overlapping. On the *outside*, glue a number of narrow strips of wood, of cigar-box covers—quite close together, extend-

ing the whole length of the splint. The objection to the dressing is the same that attaches to all the splints classed under the "shingle" head, *viz.*, that the limb requires to be well padded. In the case of small parts, however, as the fingers—this splint may answer a good purpose; but in the case of larger limbs it should never be used.

5. *Double-inclined plane*, is a term applied to a form of splint that is very useful in compound fractures of the leg, when extensive, counter-extension, and retention of the fragments in position are made without the application of bandages, leaving the parts open to inspection at all times. It is made as follows: Have a light piece of board, of the kind

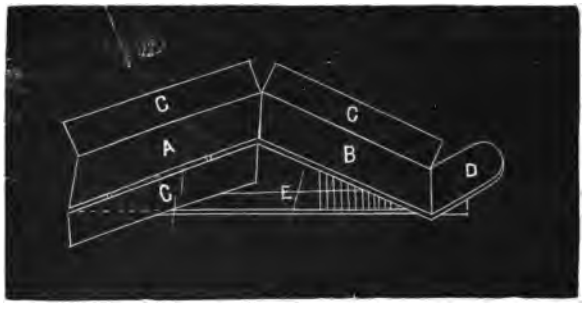


FIG. 76.

known as "siding," cut to reach from the tuberosity of the ischium to a point three or four inches beyond the heel. It should be at least five inches wide, and deeply scored, or notched, or narrow battens nailed on—for one-third of its length from the lower extremity. This is shown at "e" in the figure. Cut another piece the length from the tuber ischii to the centre of the popliteal space, (a) and attach it to the upper end of the long board by hinges. Cut a third piece, (b) to reach from the centre of the popliteal space to four inches below the heel, and unite it by hinges to the piece "a." At the foot of this last piece, securely

fasten, with screws, an upright piece (d), a little larger than the sole of the foot. The splint is completed by attaching four pieces of wood (c), by hinges, to the edges of the two shorter ones, (a-b), about four inches wide, that which comes on the inner side of the thigh to be deeply scored to avoid pressure in the groin. The splint should now be well padded, or old muslin may be spread on it, and the injured leg extended on it at full length, the sides being folded down, and the splint extended straight. To the foot and ankle, which should be covered smoothly with a layer of cotton batting—button on a snug fitting gaiter, to which strong tapes have been firmly attached. The fracture being reduced,

FIG. 77.

and the limb put in a comfortable position, attach the tapes on the gaiter firmly to the foot board. This makes the necessary extension. Now take the splint by the middle, under the knee, where it is hinged—and raise it to the required angle, the foot end being secured from slipping by the notches or battens on the under-board. This increases the extension, and weight of the body makes counter-extension. The greater the angle, the greater the tension, and hence the angle should not be so great as to cause pain. A number of long narrow muslin bags should be prepared, two or more the length of the thigh, and a similar number the length of the leg. Their diameter should be about three inches when filled. Fill them with dry sand, or clean bran, and lay them on each side of the leg, throughout its whole length. Next bring up the side pieces, and secure them by tying tapes around the whole splint. On re-dressing a limb thus treated, it is only necessary to let down the sides,

remove the bags, and replace with clean ones, when the sides are again put up and secured. The heel must be carefully watched for excoriations, and the pressure relieved, if any injury appears, by inserting fresh cotton, or cutting away the part of the gaiter that is at fault. The wound may be dressed with *Calendula* and absorbent cotton, and as soon as firmly healed, the apparatus is to be removed and a plaster bandage applied.

6. The *fracture-box*, is made like the last, except that it is only designed to enclose either the leg or thigh, and has no hinge in the middle. It is provided with folded sides, and

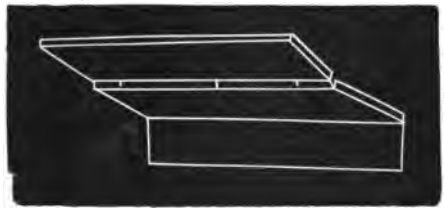


FIG. 78.

is a very useful apparatus in treating compound fractures with little or any displacement. Its mode of application is the same as in the case of the double inclined plane, but the extension and counter-extension are made in the usual way.

This includes a description of all the splints or immovable dressings that are at all essential, or that surgeons generally employ. While many varieties or modifications of splints are recommended by different writers, particularly in our journals. I am of the opinion that their use is mainly restricted to the "inventor." The accomplished surgeon will scarcely need to go outside of the list given, and in exceptional cases he must rely upon his ingenuity to adapt his dressings to the circumstances of his case. Of course an intelligent application of any apparatus can only be had by a knowledge of the

end to be attained, and the principle that govern the repair of fractures, and the general pathology of the subject. This cannot be given in a work like the present, and the student is referred to the volume of this series on "*Surgical Emergencies*.

Part Fifteenth.

BLEEDING.

There are many that may marvel at seeing a chapter on bleeding in a work written by a Homœopath, and intended for a Homœopathic text-book. It might be sufficient to call attention to the fact that there may be cases in which phlebotomy might be of service, without further argument. There are very many, however, who would be unable to select such cases, and some I fear who would unhesitatingly denounce the whole subject as a "relic of barbarism," and it will be necessary to give some good reason for presenting the topic, and endeavor to indicate clearly the nature of the emergency that might warrant the operation of blood-letting.

In standard works written by practitioners of other schools of practice, the methods employed and taught are various, including phlebotomy, arteriotomy, dry and wet cupping, scarification and the application of leeches. With but one of these have we anything to do, and even that is not employed as a curative agent, simply as a potent expedient in certain cases of great emergency. The proposal to treat inflammatory affections by the abstraction of blood, or relieve visceral congestion by counter-irritation, is as unscientific as it is useless. It is for no such purpose that phlebotomy has been retained in our surgical practice, and the necessity for its use can but very seldom arise; when the occasion *does* arise, however, the man is worse than a bigot, who for the

sake of consistency, as he interprets it—does not apply a ready remedy to save his patient from certain, or at least impending death.

I have already said that the abstraction of blood is not to be practiced to combat morbid action, particularly with a hope that inflammation will be cured or modified. For what purpose, then, may it be practiced? To restore the circulation in profound coma. There may be, and doubtless are—many students who do not have a clear conception of the distinction between coma, syncope, and asphyxia; for details they must consult the volume on "*Emergencies*," but we can say here, that while syncope expresses anæmia, or loss of sensation and will, from a loss of blood or a diminished supply to the centres of life, as the brain—coma represents a directly opposite state; viz: engorgement of the life centres, and arrest of function through stagnation or cessation of circulatory effort. In the first case, bleeding would be almost homicidal; in the second, its neglect would often be equally criminal. The chief difficulty that the mere therapeutist will encounter in cases of pure coma or asphyxia, will be the suspension of all the organic functions, to such an extent that absorption of the remedies given, by which alone their action can be developed, cannot occur. Something must be done to arouse the vital machinery. Faradaism, friction, and some of the various methods practiced to excite artificial respiration, may be practiced, and one or all of them, after patient effort, often, yes, nearly always—accomplishes the purpose. Occasionally they fail. What then shall the conscientious practitioner do? Leave his patient to certain death because bleeding was at one time grossly abused? I think not. My practice would be, although I am free to confess that the occasion never has arisen in my personal experience—to open a vein,

and abstract just sufficient blood to accomplish the purpose, *viz:* re-establishment of the circulation. With this solitary exception I can conceive of no condition in which blood-letting would be either necessary or desirable.

Having determined upon the necessity for the operation, the instruments are to be selected as follows: An ordinary thumb lancet, sharp and clean. In these days, and among practitioners of our school, it is not common to find the surgeon provided with a lancet. It is not indispensable, although, by far the most useful instrument, a bistoury, sharp scalpel, or even a good pen-knife answering the requirements. A narrow bandage must be provided, say half an inch wide and two or three feet long; this is to be used for the after dressing. Another small bandage, technically known as a "fillet"—is needed to encircle the part above the point selected, for the purpose of making the vein tense and more readily seen and controlled. This is usually nothing more than a piece of tape, sufficiently long to encircle the part once, and leave enough of the free extremities to tie securely. A knot may be tied in the fillet at the middle.

A basin or bowl will be needed to receive the blood, water and sponges at hand to cleanse the part after the operation, and the prudent operator will be provided with appliances to secure an artery, should he be so unfortunate as to injure one.

In our practice position will regulate itself, the operation being performed as a last resort, the patient being insensible and of course in a recumbent posture. The first point demanding attention will be, which vein to select for incision. Everything being equal one of the veins in the forearm are usually selected, the median basilic oftener perhaps—there being no preferance as to side of the body. By making

pressure with the thumb on the vein, if it becomes turgid below, it is favorable; if not, there may be some local condition forbiding a free passage of the blood through the vessel, and some other must be selected. The vein having been selected, place the knot of the fillet over it, and tie it firmly around the part. When the vessel below the point of constriction becomes sufficiently turgid, it may be opened in the following manner, and with indicated precautions.

When the artery of the part is not in the way, enter the lancet perpendicularly, holding it so that only a very small portion of the point is exposed, and as soon as its point has evidently entered the vein, indicated by the freedom of motion distinctly felt, depress the handle so that the point cuts its own way out, making a wound say from a quarter to half an inch in length. The direction of the incision is usually nearly in the direction of the long axis of the vessel, very slightly oblique. While making the venesection, the extremity should be grasped with the disengaged hand, the thumb making pressure on the vein below the print of entrance of the lancet, to prevent a gush of blood which may occur. The incision being completed, and the basin or bowl held in position, remove the thumb allowing the blood to flow. If it does not flow promptly, or does not run at all, make friction on the part, upwards, with some degree of force, to empty the deep veins. If the fillet is tied too tightly it may interrupt the arterial circulation, and the indication will be to loosen it sufficiently to permit the blood to flow. It must be remembered that under these circumstances the circulation is very feeble, and compression that would be trivial, at other times, may now serve to completely arrest it. Conjoined with friction, flexing and extending the hand and arm, should be practiced, the muscular action thus secured serving to force the blood from the deep to the superficial veins.

The question is often asked, how much blood shall be taken? The answer cannot be answered categorically. We may say sufficient for the purpose, which can be estimated by the effect. The intention being to re-establish vital action, the first symptom of success will be an easy flow of blood; next the patient will make one or two sighing respirations, the pulse will improve, and the eyes may be opened. At this point, the flow of blood must be arrested. The fillet is untied, the edges of the wound approximated with the finger and thumb, and drops of blood on the part washed off. A light compress of cotton is then applied, and held in position by a few turns of the roller previously prepared. The arm had better be carried in a sling for a day or two, or at least until the wound has closed—and all use of it prohibited. Remedies may be given according to circumstances, perhaps *Acon.*, will more frequently be needed, if the condition for which the venesection was practiced does not present some particular indications.

Should an artery be in close relation with the vein, the incision must be in such a direction that there is no danger of wounding it. For instance, the vein being over the artery, the former must be opened on the side; on one side, the lancet must be entered on the same side, above the vessel.

The accidents that may occur are few in number, but may be followed by very serious consequences. Those most commonly noted are thrombus, wounding the tendon of neighboring muscles, wounding of nerves, or puncture of arteries. Each of these will require especial mention.

Thrombus is a term applied to the formation of a clot of blood in the subcutaneous cellular tissue, due to an effusion of blood from the wounded vein, oftener on account of want

of care in securing harmony in the relations of the integumentary wound and that in the vessel. Occasionally from irregular tension in the skin, or an uncertain and hesitating manner in making the puncture, when the wound is closed the integument slides over the wound in the vein, and the blood cannot find exit. Probably in all cases there will be more or less of such effusion, but in the large majority of cases the condition is very trivial, and soon disappears. When the effusion is comparatively large, however, the matter may become serious, and unless care is exerted troublesome consequences may ensue. Thus suppuration may be established, and the vein partaking in the morbid action, acute phlebitis or even pyæmia come on. The indications are to keep the part at rest, even to the extent of putting in a splint—and administering *Arn.*, or *Ham.*, both externally and internally. The tincture may be applied, diluted in water, in the proportion of one to ten. When given internally as well, a dose may be administered as often as once in two or three hours. *Arnica* would be particularly indicated when the blood coagulates and forms a moderately firm clot. *Hamamelis* is to be used when coagulation is deficient, and the blood remains fluid, forming a sort of blood cyst. Should the effusion break down, and suppuration become established, an early incision must be made to give it a free exit, and the case treated as an ordinary abscess. When pyæmia or phlebitis occurs, the treatment must be in accordance with the principles laid down in the volume on *Surgical Therapeutics*.

Tendons are occasionally pricked, accidentally, or even transfixed by being mistaken for the vein. The accident is not a very serious one, although the pain and discomfort may be very considerable. The part is particularly painful on

motion, and the accident may induce tetanus, or even, in badly treated cases, result in loss of function in the part.

The *treatment* must be, place the part in a comfortable position, using a splint or sling to prevent motion. If the pain is excessive *Hypericum* must be used as laid down for *Arnica* above. Should the part be cold, and motion somewhat restricted from stiffness of the part, give *Ledum pal.*, the same way. Symptoms of tetanus will call for *Stram*, when there is twitching of the muscles; *Bellad.*, when the jaws becomes stiff, and the muscles contracted, or *Cupr.*, when there is severe pain under the sternum. More exact indications will be found laid down under the proper head, in both *Surgical Therapeutics*, and *Emergencies*.

Wounds of the nerves, to some extent at least, must occur in every operation for phlebotomy. The nature of the symptoms, and the indications for treatment, depend upon the extent of the lesion, and the character of the nerve, whether a sensory or motor twig. When the nerve is perfectly divided, there will be either loss of motion or sensation in the parts supplied, as the twig is sensory or motor. The loss of motion may not appear to the novice, as but a single muscle, or even a portion of a muscle may alone be affected. So also with sensation; the loss will be indicated by more or less anæsthesia, usually occuring in a restricted territory, and not at all times so prominent as to attract the attention of either the surgeon or patient. When the lesion is discovered, the part must be kept perfectly at rest, and *Stram.*, administered, a dose two or three times a day, for a fortnight or longer. If care can be taken to keep the part at rest so that the extremities of the nerve are not drawn too far asunder, union and restoration of function may be expected in about fourteen days, in the case of small branches. (*Vide Emergencies.*")

A *partial division*, however, will cause impaired motion, if a motor branch—or pain and hyperæsthesia, if sensory. The pain may be felt both at the point of injury and at the termination, usually it will be more continuous at the latter. Under either conditions I think *Hypericum* will be the remedy oftener indicated, giving place to others as special symptoms arise. The accident is more readily recognized than when the division is complete. Very frequently, when motor nerves are partially divided, the muscles will be spasmodically affected, either contracted (tonic) or jerking (clonic). *Stram.*, in either case, will usually be the remedy that will give the best results.

Arteries may be pricked, or even extensively wounded, and the accident will be at once recognized, not by the *color* of the blood, so much as the force with which the stream is ejected. On making pressure above the wound the hæmorrhage will be arrested, while distal pressure will produce no effect. The accident may be a very serious one, inducing dangerous conditions at the time, or secondarily by the formation of aneurism. The symptoms of wounded arteries, and the consequences resulting therefrom, are too important and numerous to receive attention at this time; a full account will be found in the proper place, under *Injuries of Blood-vessels* ("*Emergencies*"). Suffice it to say at this time, that notwithstanding the great authority of VELPEAU, we should never trust to a compress in hopes that a cure will follow. Even if the hæmorrhage should be permanently arrested, an aneurism, of some kind, will be apt to follow later, and the patient perhaps be in a less favorable condition for a radical cure. Secure the vessel at once, by ligation, or accupressure as is most convenient, and discard, in this instance as in all others, frivolous temporizing measures.

PART SIXTEENTH.

VACCINATION.

Vaccination is an operation for the introduction into the human system of the virus of the cow-pox, as a preventive of variola. Whilst eminently Homœopathic in principle, it has been employed very extensively by all schools of medicine, and is to-day the most common practice in every civilized community throughout the world. DR. EDWARD JENNER, an English physician, was the discoverer of the prophylactic virtues of this virus, and the first vaccination was performed on a boy in 1796. His attention was directed to the subject, while still a student, in 1763, from observations made in Gloucestershire, when it was the universal belief of the dairy people that those who contracted the vaccine disease from milking cows affected with cow-pox, would not contract small-pox.

Cow-pox is a disease, of contagious character, appearing as a peculiar eruption on the udder of cows, supposed to be partly due to atmospheric changes, and some errors in food. It appears in two forms, or probably degrees of severity—the differences being very largely in intensity of the symptoms. The constitutional symptoms are insignificant, although there may be much fever. The local symptoms are the eruption of pustules, irregular in size and distribution. The vesicles are first filled with clear serum, later assuming more of the pustular appearance, becoming umbilicated, depressed in the centre—and when undisturbed, drying up into a crust which

ultimately becomes detached and falls off, leaving a smooth surface without any tendency to ulceration. When removed artificially, or torn off with violence, there will either remain a long lasting ulceration, of some depth and with malignant characters—or new pustules will form, which are less perfect than the original.

Like many of the excreta of contagious or infectious diseases, the active principle of this virus is supposed to reside in the pus-cell, but its nature, that is physicial properties—has never been determined, and the microscope, as well as all other scientific appliances, has as yet failed to detect it. In other words, the secretion of the vesicles does not appear to differ from that of non-specific pus, and its character can only be determined by an observation of its effects. That inoculation produces local conditions closely resembling the exanthema of variola, is patent to all; this similarity is what convinces the Homœopath of its prophylactic virtues; in other schools of practice, however, the method is employed simply from the teachings of experience, and is not based upon any recognized law of therapeutics. It is true that reasoning from analogy, many practitioners of other schools, have attempted prophylaction from syphilis, gonorrhœa, and chancroid, by inoculation with the virus of the respective diseases; up to the present, however, one of two facts have invariably been developed, *viz.*, either no protection was afforded, or the disease from which immunity was sought has been established, and the consequences were the same as if the infection had been in the natural way.

For purposes of vaccination the virus is procured in many ways. Some preserve the crust formed by the drying up of the pustule; some extract the lymph while still fluid, and collect it on ivory points, in glass tubes, in quills, in small

capsules or boxes, or in any way that experience or fancy may suggest to them. However, collected, it must be remembered that like all animal matter it is subject to decomposition, and not only will its virtues as a prophylactic diminish in proportion to the degree of decomposition, but it becomes an element of danger, inducing septic or pyæmic conditions when introduced into the system of a healthy individual, just as any other decomposed animal matter would. Like most of the specific secretions, heat and acids will destroy its specific virtues, while cold, even when long subjected to its influences, will not have any appreciable effect on it. This should teach us caution in using virus that has been exposed to the air for a number of days, been kept in a warm place, or that may have been subjected to influences that would deteriorate it. Whether in tubes or points, there can be no question that two vaccinations, after the interval of twenty-four hours, should not be made from the same specimen. The tube or point should contain just sufficient for a single vaccination. In winter, of course the danger of decomposition would be greatly lessened, but a proper caution and regard for the physicial welfare of those reposing confidence and trust in us, would forbid our running any risk by using virus that might possibly have undergone some vital change. Treating it with Carbolic acid, or any of the so-called antiseptic agents, will only retard putrefaction, and will at once effectually destroy the activity of the virus.

The best and only rational method to pursue to preserve the virus until needed, is to have it put up in such a way that it is thoroughly protected from the air, and as far as possible beyond the reach of atmospheric changes. Nothing is better, for this purpose, than to have it put up in sealed glass tubes, or enclosed in wax. The method of Dr. Wm. Husband, of

Edinburgh, (HOLMES' *Syst. of Sury.* V. p, 543), is described as follows: "He recommends for the purpose such (tubes) as are from two to four inches in length, and about 1-28 of an inch in diameter, their walls being 1-200 of an inch in thickness. The vesicles having been opened with the lancet in the usual way, the tube, held horizontally, is charged by applying one end of it (the straight end, if they be not both straight, not that which tapers to a point) to the exuding lymph, which enters immediately. As much lymph is allowed to enter as will fill from one seventh to one-half the length of the tube. As a general rule, each tube should not be charged with more than will suffice for one vaccination. It may be sealed in one or other of the following ways. In the first, the lymph is made to gravitate towards the middle, by holding the tube vertically, and if necessary giving it a few slight shocks by striking the wrist on the arm or table. The end by which the lymph entered may then be sealed, by applying it to the surface of the flame of a candle. The other end should be plunged about half an inch into the flame, and as quickly withdrawn till it touches the surface, when it should be held till it melts over and is sealed. This precaution, of plunging the tube, into the flame before sealing it, is useful, in order to expel a portion of the air, or the tube may be sealed thus: the lymph having been introduced at one end of the tube, is made to pass towards the opposite by exausting the air at that end over the flame of a spirit lamp; this end of the tube is then sealed. On cooling the lymph will pass towards the middle of the tube; the orifice by which the lymph entered is then sealed, as in the first method. Not more than a minute or two should elapse between charging the tube with lymph and sealing it up, or the lymph will concrete at the orifice, and cannot then be forced into the

centre of the tube." By keeping the lymph at the centre of the tube it is not acted upon injuriously by the heat. When using the lymph thus preserved, the sealed ends are to be broken off, and the lymph blown out on the lance.

The operation of vaccination must be performed under certain precautions, due attention having been paid to the purity and potency of the virus. In hot summer weather it is well to avoid it, unless the existence of epidemic small-pox demands it. This is not from the effects of temperature on the individual, so much as upon the virus. Under all circumstances, unless a number are vaccinated simultaneously in one household, the same virus should not be used a second time, nor should the lancet or vaccinating instrument be used on a second person until thoroughly and scrupulously cleansed. Under peculiar conditions the smallest particle of decomposed organic matter introduced into the absorbents will set up the most violent and dangerous septic symptoms.

It is also a matter that should receive the most scrupulous attention, that vaccination from humanized virus—that is crust, taken from those who have been vaccinated—should never be made. If pure cow-pox virus cannot be obtained, I think it is even preferable to omit it altogether until it can be procured. With each revaccination the amount of virus becomes less and less and the septic material correspondingly increased. It is a matter of impossibility to avoid some septic inoculation, although it may be very slight,—and we certainly run a risk of introducing some other specific virus under such circumstances. Whether it can be, as some affirm—detected, we certainly know that syphilitic blood is a fact, and the horrible contagion may be communicated mediately. From every point of view, therefore, humanized virus should not be used.

Having selected the virus, the operation is performed as follows: The point of insertion is purely a matter of taste; one part of the body is as capable of inoculation as another, the sole consideration being too choose a locality that is not habitually uncovered, as the scar resulting is somewhat of a blemish. For this reason the usual site is on the left arm, just below the insertion of the deltoid. The skin at the point selected is to be scarified, or abraded either by scratching it with the lancet, or making minute punctures or incisions. It is not necessary that blood should be drawn, indeed hæmorrhage would often have the effect to delay absorption. For the purpose of making the abrasion there are a variety of instruments. The majority of practitioners use the ordinary thumb-lancet; some a small scarifier, like a minute comb with sharp teeth. Still others use a vaccinating instrument, by which a hollow needle, like an aspirator—is forced under the skin, and a piston fitting into the cavity of the needle, and released by a spring, is forced into the puncture carrying the virus with it. I must emphatically object to this instrument in all of its forms. It may answer very well for one or two operations, but after that, unless extraordinary care be taken, it will become unfit for use from the greater or less amount of animal matter that must adhere to it.

Having made the puncture, the virus is to be introduced. If ivory points are used, the dried virus on one of them must be softened by holding it for a moment in the steam from hot water, and then rubbed off on the wound, crowding it into it with the point of a lancet. It may be best to insure success, to make more than one puncture on the same arm. If so, they should be made about an inch apart.

When completed, allow the lymph or blood that has exuded to dry, by exposure to the air, but do not apply any

plaster or dressing of any kind. If the child should be ungovernable, and there is danger of its scratching the part, or otherwise irritating it, a small piece of cotton may be laid on and secured by a narrow strip of adhesive plaster.

When successful, the vaccine affection will run through the following course: On the second day a slight elevation will be observed, of a delicate rosy hue, all signs or marks of the operation having previously, in most cases, disappeared. About the fifth day a red pimple appears at the point of puncture, which the next day, or at the latest the day after—becomes a pustule. This gradually increases in size, surrounded by a more or less bright-red areola, and may attain a diameter of a quarter of an inch. The lymph is at first clear and milky, soon becoming yellow, and finally drying into a brown crust, depressed in the centre, which drops off about the twenty-first day. A dark areola, with profuse pus, much pain or constitutional disturbance, and a dirty yellow color of the crust will indicate a failure, as to vaccination and infection with some other specific virus or septicæmic difficulty.

Ordinarily there is little constitutional disturbance, a slight fever on the seventh day, and some pain on motion in the arm, with a slight fullness in the axilla being the maximum in general. A higher grade of fever and more profound disturbance of harmony in general, will indicate either vaccination with impure virus, or the invasion of some latent or acute disease, perhaps excited by the operation. The symptoms indicating specific infection will be as if it had been induced by other means, and will be readily told by the experienced practitioner, at least by reference to the standard authorities. The appearanee of the pustule will be syphilitic in syphilitic cases, chancroidal in similar

cases, or scrofulous when purely septic. Reference to *Surgical Therapeutics* will give the peculiar appearances.

When the crust or scab has been removed, in successful cases, the scar remaining will become unnaturally white in color, depressed, and of an uneven surface. It will gradually fade out, and after some years often disappears entirely. Some practitioners attempt to judge of the continuance of protection by the appearace of the scar, but it is generally thought that this is not positive. How long protection will continue is a question of some moment, but one that cannot be accurately answered. Some observers esteem t perpetual; others limit it to from seven to ten years. It can only be told with accuracy by the results of re-vaccination. It is a proper plan to attempt this about once in ten years, and, if after repeated operations, inoculation is not produced, the individual is still protected.

We may note in closing, that if the fever runs high, a few doses of *Aconite* will usually make things all right again. If septic conditions arise, *Arsen.*, *Lach.*, or *Carbo veg.*, or even *Rhus* may be used according to indications as they arise. Specific infection will call for *Merc. cor.* usually, but the presumption is that nothing will cure the victim, the disease is implanted in him for the remainder of his life, and will in all probability be transmitted to remote posterity should he survive the period of childhood.

It is proper to nc te, while not exactly germane to our topic, that there is a very large and respectable class of pract tioners who are opposed to vaccination under any circumstances. BŒNNINGHAUSEN and others, claim perfect prophylaxis in *Thuja*, administered during the prevalence of an epidemic of variola, and certainly when we consider the many dangers that hang about this apparently simple

operation, and the disastrous consequences that follow the introduction of impure virus, it cannot be denied that there are many reasons why conscientious practitioners should hesitate to expose their patients to such danger. On the other hand, the evidence is so clear and conclusive that compulsory vaccination has not only checked an epidemic of variola, but banished it for years from infected districts, that it will be long ere the practice is abandoned; at least it will not be until something equally certain is offered, and that will stand an equally severe test.

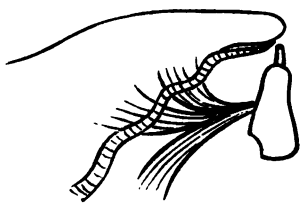
Part Seventeenth.

TONGUE-TIE.

Occasionally infants will be found unable to suck properly when nursing, and on examination the frænum of the tongue will be found shortened, so that the tip is drawn downwards, sometimes to an extent that keeps it close to the lower jaw. If the difficulty in nursing were the sole impediment to perfect function, there are many cases that might be left without treatment, as the parts will to some extent accommodate themselves to the malformation. Unfortunately, however, the defect will likewise embarrass the speech when the child becomes older, and from the plastic and cartilaginous character of the jaws and bones generally, some osseous deformity may be produced. The defect being recognized, therefore, some treatment must be instituted to remedy it.

To properly comprehend the rationale of the operation proposed, it is essential that the student should recall the anatomy of the parts involved, particularly the arterial distribution. The apex of the tongue is attached to the lower jaw by the genio-hyo-glossi muscles, which are partly attached to the tubercles on the inner surface of the symphisis. The mucous membrane covering the tongue, assists in this connection with the jaw, by attachment to the gums and inner surface of the jaw. A distinct fold of this membrane constitutes an especial and important attachment to the maxilla, and is called the frænum linguæ. It is the ab-

normal shortening of this that constitutes the affection known as tongue-tie. At this time, it will be noticed the continuance of this shortening for some months, or a year or more, must have the effect to shorten the muscles, and render a simple section of the frænum insufficient to a cure. The ranine artery is a branch of the lingual, which after ascending perpendicularly near the origin of the genio muscles is directed forwards, nearly at right angles to its former course, running along the base of the tip of the tongue. (See A in the accompanying figure). When the frænum is too short, the muscles and artery are both drawn farther forwards, and incision of the mucous fold must expose the vessel to injury to a greater extent than when all the parts are in a perfectly normal position.



a FIG. 79.

The deformity is easily detected, when extreme, but some embarrassment may be experienced when not so marked. In a normal condition of the parts, the tip of the tongue will be occasionally protruded, but can at all times be seized between the finger and thumb. When this cannot be done, and suckling is defective, the diagnosis is made out, and an operation must be performed.

Have the child held in the lap of nurse or an assistant, the hands firmly held, and the head thrown back. Another

FIG. 80.

assistant will then depress the lower jaw so that the operator shall have both hands free. The instruments needed are

a pair of blunt-pointed sharp scissors, and a director, as in Fig. 80, which is found in all pocket-cases of instruments. Insert the broad extremity of the director under the tip of the tongue, engaging the frænum in the slit. Raise the organ and elevate the director so that it will not be in the way of the scissors, thus putting the frænum on the stretch. With the scissors now nick the frænum to the extent of a couple of lines, directing the incision downwards and backwards, keeping as close to the jaw as possible. Be careful that nothing but the mucous membrane is included in the incision, as it will produce possibly serious results if the muscles are divided. The child is to be immediately put to the breast, which will have the double effect to increase the division in the frænum, and to arrest the bleeding, which last, however, is usually very trifling.

Simple as the operation seems, it is not entirely devoid of danger, as a few recorded cases will amply testify. At the present day accidents rarely occur, but in the last century, or the first part of the present, it was a common occurrence for ignorant midwives to tear the frænum with finger and thumb, sometimes tearing up the muscular attachments, lacerating the arteries, and it the little patient survived the "treatment," producing an aggravation of the deformity by the cicatricial contraction ensuing.

The accidents at the present day are chiefly one of there, viz.: hæmorrhage, falling back of the tongue, and tetanus. The first is due, of course, to division of the ranine artery, which cannot be of frequent occurrence, unless there is some anomalous distribution, or the incision is made too high. The occurrence will call for prompt treatment, and from a consideration of the age of the patient, and the function of the part, the ordinary means for arresting hæmorrhage can-

not be employed. Should the accident happen to me, I should pass a fine needle through the frænum, armed with a fine cat-gut suture, and tying it tight, cut off the ends close. Such a practice would be far preferable to styptics, and certainly should be preferred to ligation of the lingual.

The tongue has fallen back into the fauces, closing the glottis and posterior nares, and greatly endangered life. This is due not so much to extensive injury to the frænum as to section of the muscles. By exercising some caution in making the section, and ascertaining that nothing but the mucous membrane is engaged between the points of the scissors, such an accident should never occur. It must always be an evidence of bad surgery. It might be remedied by passing a ligature through the tip of the tongue, and attaching it to adhesive strips on the chin. Possibly in some instances, it would be practicable to unite the edges of the incision by a fine suture. In either case, the ligature or suture should be retained until the wound has united.

Tetanus may follow the operation in the case of very sensitive children, particularly if the operation has been bunglingly performed, and the incision made by a succession of snips with the scissors, rather than a single decided cut. The treatment will be as usual in that condition.

Ordinarily there will be little pain, the child nursing with avidity immediately after the operation, but *Hypericum* had better be given for a day or two.

The condition is not as frequent as our text-books would lead one to suppose, at least as far as my experience goes; the cases occurring in my practice not having exceeded half a dozen.

Part Eighteenth.

CATHETERISM.

Catheterism is the operation for evacuating urine from the bladder, in cases in which, from any cause, it is incapable of evacuating itself. The term is also applied for want of a better one—to operations for the injection of fluid or air, into some of the visceral cavities, through the medium of a hollow tube. Thus the eustachian tube, under some circumstances, requires dilatation, and a catheter made for the purpose is employed. In some conditions the bladder will require, or is thought to require washing out, either with medicated solutions or chemical agents, and a special form of catheter is used for the purpose. At this time, however, we have only to consider catheterism as applied to the bladder, that of the eustachian tube coming more properly under the consideration of special practitioners. Even as confined to the bladder, the operation is one of some importance, and very frequently will be found of exceeding delicacy, requiring accurate anatomical knowledge, and very considerable manual skill and dexterity. So frequently is this the case, that the subject had better be reserved for consideration under major surgery, but inasmuch as the general practitioner will be frequently obliged to resort to it, it will receive attention at this time, and with somewhat greater minuteness than has been bestowed upon other topics in this volume.

We will first consider the instrument used in the opera-

tion. The catheter is a cylindrical instrument, varying in length from four to ten inches, as it is designed for women, young people, or adult men. In diameter, from the size of a quarter of an inch to a mere thread. In general form, they are curved at the tip, the curve according to Mr. Briggs, of London, "corresponds to rather less than one-third of the circumference of a circle three inches and a quarter in diameter." The curve, however, varies somewhat; in young persons it is shorter; in the fleshy somewhat increased; in those who suffer from prostatic hypertrophy, the curve must be extreme and shorter, or much lengthened, the instrument almost straight. In different conditions, also, such as various forms of stricture of the urethra — the degree of the curve is varied, each case, almost, requiring especial consideration. Catheters are spoken of as of various sizes, according to the annexed

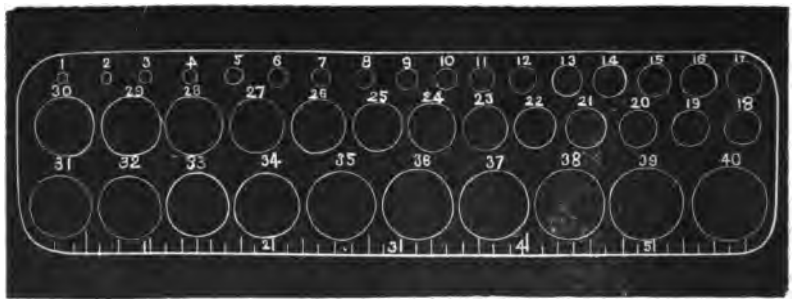


Fig. 81.

scale, from 0 up to 14 or more. For ordinary use, No. 6 or 8 is undoubtedly the most useful. The usual forms of catheter are as in the cut (82), the end entering the bladder being perforated with a fenestra on each side, and called the *beak*. The opposite extremity is called the handle, and has a ring attached to each side, both for the purpose of attaching tapes when it is desired to retain it in the bladder, and to

indicate the direction the beak is moving in, when entered in tortuous canals.

The material from which catheters are made is not constant; some are made of metal; others of some soft yield-

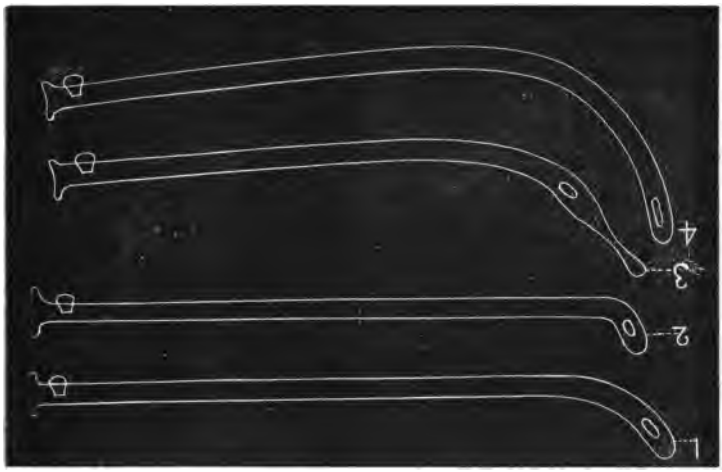


FIG. 82.

ing material, as gutta percha. When of metal German silver, silver, or baser metals electroplated (gilt or silver), are used. For the general practitioner, a convenient size and form is a No. 6 silver instrument, in three parts, fitting into each other by a screw-joint, so that little space is required in which to carry it, and instruments for both male and female are always at hand (Fig. 83). No. 1 in the figure, when attached to No. 3, forming the female instrument, and No. 2 the male. The joints must be perfect fitting, and when joined the rings in the handle should be quite accurately at right angles to the long axis of the cylinder. Catheters of gutta percha are generally provided with a wire stylet, which serves to keep them stiff, if desired, when used, or alters the curve of the tip by partially withdrawing it. They are made like the metal instruments, of all sizes,

always for use in the male, however, and olive-pointed, conical, or rounded as occasion or fancy may dictate.

There are many forms of catheters that different makers or surgeons have invented from time to time, but the surgeon who cannot introduce the ordinary instrument, of suitable size and varying curve, cannot do much better with any patent affair. We have jointed catheters, made of a number of segments strung on a wire, which I think should never be used. It is not seldom that the wire has broken, and some of the segments left in the bladder or urethra. So also there are a number of instruments provided with some kind of flange or spring attachment, designed to keep the catheter in the bladder when it is desired to retain it. *All* of them had better be left on the instrument-makers hands; they are all more or less hurtful or inefficacious.

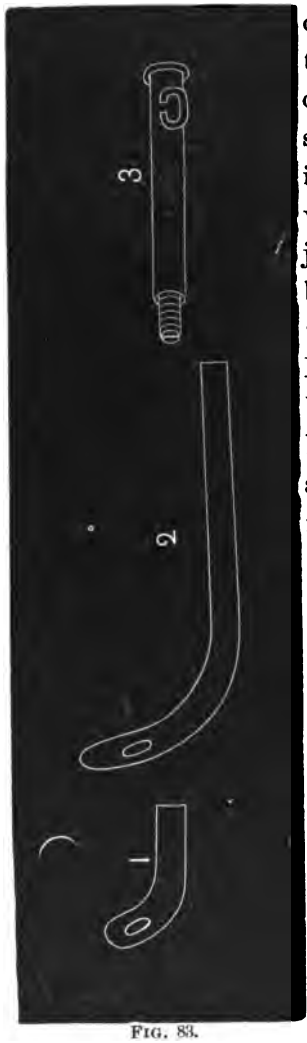


FIG. 83.

For purposes of injection, or to wash out the bladder, the double catheter is very useful, and is indeed often indispensable. It can be procured of any calibre above 5, I believe, and will be more generally useful if about No. 8. Other special forms that are required in exceptional cases, will be considered later, as well as in

the appropriate chapters in *Emergencies and Operations*.

Before giving the procedures for the introduction of the

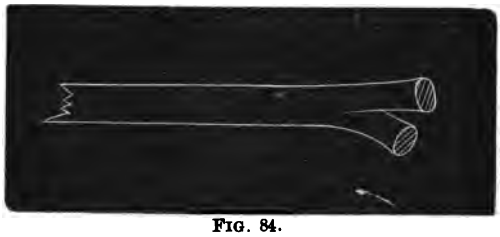


FIG. 84.

catheter, it is necessary to give some attention to the anatomy of the urethra, at least sufficient to lead to an intelligent comprehension of the difficulties that may be encountered, and to suggest measures to overcome them. The male urethra is simply a prolongation of the urinary bladder, (1) and is divided, from behind forwards into three portions which are important landmarks in urethral surgery. In its passage forwards th urethra passes through the deep perineal fascia. The *first part* is known as the *prostatic portion* (4) and is the widest and most dilatable portion of the canal. It passes through the prostate gland, and terminates at the point of exit through the perineal fascia. It is perforated by numerous small orifices, the ducts of the glands, and the centr th floor is marked by a ridge (2), an elevation of the mucous lining, called the *veru montanum*, (or *capet gallinaginis*), which is pro-

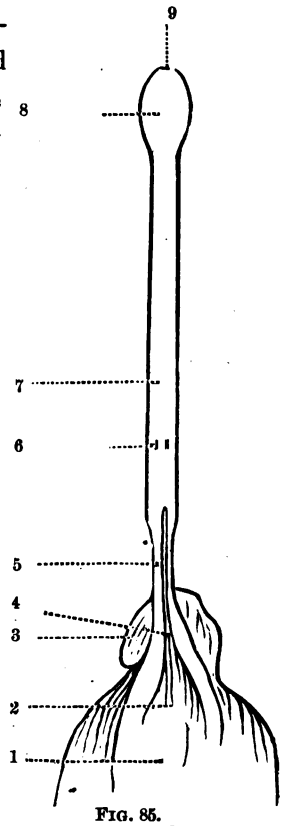


FIG. 85.

longed into the membranous portion. In the middle of the floor there is a depression, the sinus pecularis, in which are found the orifices of the ejaculatory ducts. It will be observed that all of these openings are on the floor of the canal, indicating that the beak of the catheter must rather incline to the upper surface of the canal to avoid them. Particularly is this true of the sinus.

The second portion of the urethra, (5) is known as the *membranous portion*, and is the most constricted of the three. The *veru montanum* extends into this, for its whole length, and when the penis is engorged, or in a state of erection, this is notably enlarged; the calibre, therefore, is correspondingly diminished under those circumstances. Immediately at its junction with the third part of the canal, we find a remarkable enlargement, called the bulb (Fig. 86), which extends backwards, under the membranous portion for quite half or one-third of its length. This portion of the urethra derives surgical interest from the fact that it is the usual seat of stricture; is extremely sensitive, so that the catheter cannot be borne, at times; that the perineal fascia often engages the beak of the catheter so that the prostatic orifice is not at once found. The fascia is indicated at 5, in Fig. 86. It occasionally happens, also, that the dilatation of the bulb is so great, that a *cul-de-sac* forms around the orifice of the membranous portion, and the difficulties of catheterization are greatly increased.

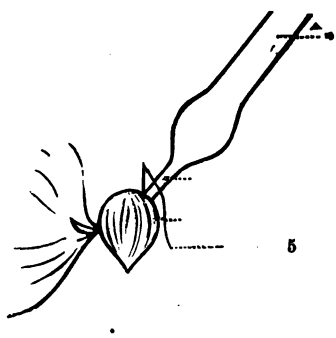


FIG. 78.

The last division of the urethra, known as the *spongy portion* (7, Fig. 85), extends from the membranous portion to the *meatus* (9), and is the least distensible of the three. The points of interest are, first the orifices of the ducts of *Cowper's gland* (6), at the bulbous portion; and second, the considerable dilatation at the anterior extremity (8) known as the *fossa navicularis*, which presents a constriction at the inlet and the outlet. This constriction, particularly with the employment of an olive-shaped catheter beak, might lead to a suspicion of stricture, unless the student is prepared for it by previous knowledge. As a matter of fact, stricture of the urethra usually occurs at one of these points, viz., the entrance to this fossa, or at one extremity of the membranous portion. The existence of such an impediment, however, cannot be told by the novice unless it is very tight. Morbid action will frequently cause such an enlargement of the bulbous portion, that the beak of the catheter is almost inevitably engaged in the fossa at its termination, and a stricture suspected when none exists.

Imperfect and cursory as this description is, it is all that will be needed to point out the difficulties experienced in introducing instruments into the bladder, and must be borne in mind when attempting such operations. The particular points of interest, from before backwards may be arranged in the following order: the cul-de-sac, at the base of the bulb, greater on the floor of the canal; the perforation of the perineal fascia by the membranous portion; the orifice of nearly, if not all of the glands and ducts opening into the urethra found on the floor of the canal.

Introduction of the catheter may be performed sitting, standing, or lying, with decided preference for the latter. In the case of persons of adult age, an instrument is selected

of calibre sufficient to fill the canal, it being safer, as far as entrance to the bladder is concerned, to use an instrument larger than is necessary, rather than one too small. By this means the folds or *rugæ* are smoothed, and the beak is less liable to become engaged in false passages, in the numerous fossa, or in the orifices of enlarged ducts. Impressing our minds fully with the fact that the utmost gentleness and tact are to be employed, and that address and scientific knowledge are to take the place of mere force, the operator is in little danger of forcing his instrument through the mucous surfaces, and make false passages.

First warm and lubricate the catheter with oil or soap, and see that the margins of the fenestræ, or the joints, if there be any—are smooth and rounded. Sitting facing the patient, on his left side—take the glans penis between the thumb and finger of the left hand, raising the organ vertically, or slightly drawn upwards on the abdomen; introduce the beak of the catheter into the meatus, holding the instrument with the concavity directed toward the abdomen, and by a gentle motion press it in, onwards towards the bladder. Upon reaching the bulbous portion, slightly depress the handle towards the thighs, and cause the beak to hug the upper surface of the canal. A slight sensation will be communicated, on the passage of this point, to the hand. When the perineal fascia has been reached, depress the handle still more, and if the beak does not pass into the prostatic portion readily, do not force it. Withdraw the instrument very slightly, and by further depression of the handle, and slight changes in the direction of the beak, the passage will soon be found, and the mere weight of the instrument will usually carry it the rest of the way into the bladder. When the prostatic portion has been reached, apply the forefinger to

the open end of the catheter, to guard against the emission of the urine until ready with a vessel for its reception and bring the head of the instrument down between the thighs, which is a position it will assume without assistance from the surgeon.

When the bladder is empty, withdraw the catheter gently describing a curve with the hand over the left groin.

In the female the operation is simpler, in one sense, inasmuch as the urethra is short, and is not so complicated in structure. Having found the meatus, and entered the catheter there is no further difficulty, the slightest pressure carrying the instrument into the bladder. The great difficulty is to find the meatus; this is at all times somewhat puzzling to the novice, but when retention of urine after parturition calls for catheterization, the swelling of the parts increases the perplexities ten-fold.

In this operation the patient always assumes the recumbent posture, and is to be covered with a sheet, or the bedclothing, so that no exposure of the person, even of the lower extremities is made. She should lie on the back, close to the right side of the bed, if possible, the knees separated and drawn up. The tip of the forefinger of the left hand, is to be introduced between the labia, and placed at the upper edge of the vaginal outlet. The catheter, well oiled and warmed—is then introduced by sliding the beak along the upper surface of the forefinger of the left hand, the point directed upwards, and will usually slip readily into the meatus. If this fails, the left hand is passed over the right thigh, and the forefinger, nail downwards—rests on the vestibule, immediately beneath the glans of the clitoris, which is slightly pressed upwards. The catheter is then introduced, using the nail of the left forefinger as a guide—and will rarely fail to enter

the meatus. When the bladder is reached, the outlet of the catheter must be closed with the finger until a vessel is ready for the reception of the urine. The operator must keep a firm hold on the catheter, as there is a tendency, in many cases, to have it retracted into the bladder.

There are unquestionably cases, in which the extreme swelling and tumefaction of the parts, or the existence of some morbid action or anomaly, in which it is impossible to find the meatus in either manner indicated above. After patient and repeated effort, if this cannot be accomplished, the parts must be uncovered, and the operation completed by the aid of vision. This must, however, be seldom necessary, and should never be insisted on except upon conviction of its positive necessity.

It is sometimes necessary, only in the case of men—to keep a catheter in the bladder, more particularly when it has been introduced with some difficulty, and it is deemed inexpedient to renew the irritation always produced by such manipulations frequently. There are very many methods for securing the instrument, all more or less useful in appropriate cases, but either of the following will usually answer every purpose. The method of GROSS (*Syst. of Surg.* II, p. 748) seems to be the least objectionable of the two, and is described as follows: "The one which I usually prefer is the double T bandage, the thigh pieces of which are fastened in front and behind in such a manner as not to interfere with the anus or scrotum. The instrument is secured by two strips of linen tape, or oiled silk, by tying the middle of each to the rings of the catheter, and the ends to the vertical bands." In my experience the rings of the catheter have a tendency to irritate the glans, and some fine cotton had better be inserted beneath them.

Another method, is to encircle the penis with a few turns of a roller, or one or two thicknesses of oiled silk, immediately behind the corona, and attach tapes from it to the catheter rings. Whilst either of these methods are perhaps the best of any that seems possible, there is no question that they only partially and imperfectly fulfill the indications. Bodily movements of the patient, will make the traction too great or too little, and the presence of the catheter has a tendency to excite erections of the penis, which makes painful traction on the tapes. The occasion can seldom arise for such precedures, and our daily increasing knowledge of therapeutics will have the effect to correspondingly diminish the necessity.

One of the most frequent embarrassments in retention of a catheter in the bladder, is the tendency to the deposit of urinary salts on the beak, chiefly phosphates—and much annoy the surgeon upon attempting its withdrawal. When the salts are uric acid, which is very rarely the case, or oxalic, which is still more rare,—it is impossible to withdraw the instrument without inflicting more or less injury on the lining membrane. The result will often be stricture, from cicatricial contraction, even in spite of the utmost care to prevent it. When the salts are phosphates, however, they will usually be so soft that no difficulty will be experienced, although there are instances when their consistency is quite dense. In all cases, however, the fragments breaking off on attempts at reduction, are capable of forming a nucleus for vesical stone, and there are a few such cases on record.

Finally, it remains to be considered, the method of introducing the male catheter when some abnormality exists in the urethra, either as to form and capacity, or sensitiveness.

The existence of *stricture* in the urethra occasionally re-

requires a degree of skill and knowledge that cannot be imparted at this stage of our studies; the subject must be deferred for further consideration. In cases, however, in which the condition is readily made out, if a small sized catheter will not pass, it is best to make the attempt with the flexible gum-elastic instrument, particularly one with a conical beak (vide Fig. 82. 3). The young surgeon should never persist in cases of difficulty, at least without the presence and counsel of some more experienced colleague. Irretrievable injury may be done by making false passages, by forcing the instrument through the urethral walls. It is possible, also, in exceptional cases, to engage small instruments in the duct orifices, and thus inflict great injury. The accurate diagnosis of stricture can only be made by means of proper instruments (for which consult *Surgical Operations*). In all cases of doubt, therefore, or of unusual difficulty, the best interests of surgeon and patient will be secured, by seeking competent counsel.

In other cases, there may be prostatic hypertrophy, and the ordinary instruments cannot be inserted. In such cases the instrument shown at No. 1, (Fig. 82), will be the most frequently useful, but a perfectly straight catheter will sometimes succeed better. The manipulations are the same, as when other instruments are used, excepting that the horizontal position of the catheter is assumed as soon as the membranous portion is reached.

Many other difficulties will be met in surgical practice, but their consideration must be deferred for the present.

In some cases, particularly in masturbators, the urethra will be found exquisitely sensitive, throughout its whole course, but particularly in the membranous portion. In some countries, like Switzerland, where masturbation is very

common owing to the solitary life the goatherds lead, the usual sensations of orgasm are soon lost, and sticks and foreign substances are pushed into the urethra to excite the lost thrill. Here we would not expect to find the sensitiveness referred to; in this country, in the city particularly, such extreme practices are rare, and the sensitiveness is quite common. People of a highly nervous organization, particularly students and broken-down business men often present the same peculiarity. I mention this that the impression may not be conceived that such hyperæsthesia is indicative of masturbation; it is a symptom of value only when taken in connection with others. Cases have occured in which fainting, spasms, or even death has followed the introduction of a catheter that met with no unusual impediment. A spasmodic stricture of the urethra is a common effect, and is detected by the difficulty felt in withdrawing the instrument, it seeming to be grasped and held by a living creature. In such cases the extraction should be effected with great gentleness, and occasionally pressing the glans back with some force will at once relax the constriction. In the absence of particular indications for other remedies, *Bellad.*, will usually relieve this sensitiveness. When it is extreme, however, and instruments of all sizes are alike provocative of suffering, unless the case is one of great urgency, the attempt should not be persisted in. *Bellad.*, will usually allay it; a weak primary electro-galvanic current will often do so promptly; but with no urgency, a daily partial introduction, each day continuing the effort a little longer, and going deeper at each sitting, will be a proper course to pursue, but not to the exclusion of other measures as given above.

In closing I will remark, to add force to what is sufficiently apparent, that metallic catheters are the standard instruments.

The flexible instruments, while used extensively by men of reputation and authority, I have always used and considered as exceptionally indicated. When a catheter is to be retained in the bladder, it should always be a metallic one; the flexible articles being readily softened, and hence as inefficient as they may sometimes be pernicious.

PART NINETEENTH.

INJECTIONS.

For purposes of cleanliness, to remove impacted excrement, or to open canals or cavities partially closed by excessive secretions, it is sometimes necessary to direct a stream of water, or other fluids, into such passages, by means of syringes of various shapes and patterns. The operations are, for the most part, very simple, and some of them are daily performed in domestic emergencies without the aid or counsel of the family medical attendant. Nevertheless there are many instances when the mother is unfamiliar with enemata, as injections into the rectum are otherwise called—and it is important that the physician should be able to properly instruct, both by precept and example. In other cases, it would be improper to commit the operation to laymen, it requiring some skill and anatomical knowledge.

1. *Injections of the lachrymal canal*, should not, as a rule, be attempted by the general practitioner, unless his remoteness from cities, or a special practitioner, renders it an absolute necessity. It is made for the purpose of opening the passage where it is filled up by the inspissated or the altered lachrymal secretion. The instrument needed is known as ANELS' Syringe, and is usually provided with two or three nozzles, straight and curved, and of different sizes. The lower lid is put upon the stretch, in the case of the left eye, the surgeon standing behind the patient—and putting the left arm around the head, drawing the lid outward by

pressure with the fore fingers. By slightly depressing the lid at the same time, the puncta will be directed forwards,

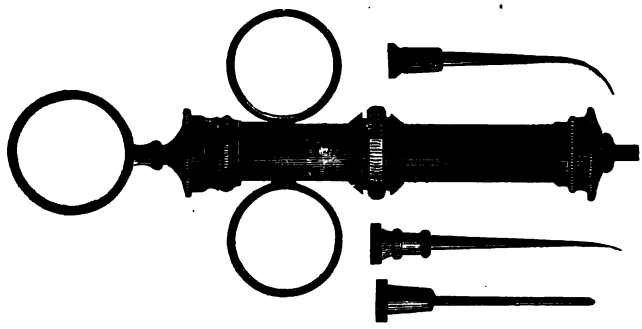


FIG. 57.

and thus brought more readily into view. Having the syringe filled with warm water, insert the forefinger in the ring in the piston, grasping the body or tube with the thumb and fingers, and gently insert the nozzle into the puncta. Be sure that a fold of the conjunctiva is not carried before the point, which would be apt to cause a wound or defeat the operation; when well entered, by a slow and steady pressure on the piston, force the injection into the canal. Success will be indicated by the appearance of the injection through the nose, or into the fauces. To guard against accidents, the syringe had better be steadied by resting the little finger on the cheek. If the fluid all enters the canal and sac, and yet does not appear in the nose, there is evidently a stricture of the passage, at some point, and the case must be sent to a special practitioner. If the lower puncta should be impervious, the injection may be passed through the upper; when practicable, however, the lower is usually preferred.

In the case of the right eye, the surgeon will stand in front of the patient, draw the lid outwards, towards the temple,

with the left hand, and using the syringe with the right carried over the other hand. Should the operator be ambidextrous, it is a matter of convenience, only, which position he assumes.

2. *Aural injections* are made for the softening and extraction of hardened cerumen, or ear-wax, and while performed with greater facility than the last, is occasionally a matter

FIG. 88.

requiring some carefulness, and not entirely devoid of some degree of danger. The instruments are a *proper* syringe, and some kind of vessel for the reception of the fluid as it is discharged. A tin-cup or an ordinary tin-basin will answer very well, but a proper vessel as shown in the cut—will be

found the best. The water should be about blood-heat (98. 6°), and should not be injected with great force, and yet with sufficient to fulfill the indications. It is good treatment to remove at least a portion of the cerumen with a curette, after being softened by the water; unless performed by an experienced aurist, or with great gentleness, the curette or forceps must be avoided.

3. *Nasal injections*, while frequently a very useful adjunct in the treatment of nasal catarrhs, are very much overused, and have more than once been the cause of severe injury, and converted a trifling malady into a very destructive process. Particularly is this true when salt-and-water is used, or in fact any medicated injections. When circumstances seem to require such treatment, nothing but simple warm water must be employed. While admitting that there may be occasion for such practice, I have never yet met a case in which it was indicated, and speak entirely on theoretical grounds, giving the instruction at second hand.

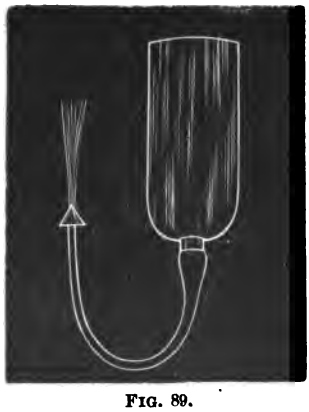


FIG. 89.

Some one of the "nasal douche" instruments, as shown in the cut, will answer every purpose. I am much mistaken if the physician will not be disappointed in the result of such treatment, if he is capable of correctly appreciating the relation of cause and effect. The catarrh will either be much increased, or the parts will take on other conditions, becoming dry and hot and the malady for which the injection was employed being simply altered in form, perhaps aggravated in every way.

4. *Vesical injections*, in our school of therapeutics, can

only be warranted as a means for removing *debris* after operations for stone. They are made by introducing a double catheter (Fig. 84), and injecting through an ordinary syringe, warm water in the upper orifice. The quantity of water thown in depends entirely on circumstances; it is to be continued until it is discharged as clear as it entered, all foreign material having then been removed.

5. *Vaginal injections*, like those into the nasal cavities, are greatly abused, and used a hundred times when once would be sufficient. They are also much used by those who degrade marriage into a licensed prostitution, for the purpose of avoiding conception. In such cases, however, the offense carries its own punishment with it, and the penalty is well earned, demanding no sympathy from the right-minded. For ordinary leucorrhœal discharges, it is useless, as the vagina is a self-cleansing canal, and injections, whether medicated or not, are almost certain to aggravate the condition, or perhaps suppress it and set up more serious morbid action. There may be cases, however, when the flow is irritating and perhaps malignant, particularly when proceeding from ulcerative action—when the blood, pus, and detritus may induce septic poisoning, and some means to ensure its removal may be demanded. Even this is very problematical at least the indications are not clear to me; I have never had occasion to resort to such practices, and unless my views should undergo a very radical change, I never shall. The instruments used for this purpose are very many, the chief indication appearing to be something that will cause some expansion of the walls of the canal, smoothing out the rugæ, and which will direct the stream in various directions.

6. *Rectal injections*, for the purpose of securing evacuation of the bowels, is very frequently a necessity, but is also very

much abused. Habitual use of such methods will surely induce hæmorrhoids, fissure or ulcer of the anus, and can scarcely fail to render the constipation habitual. The best syringe, I think, is that known as the MAW'S *Enema Pump*, or the ordinary family syringe, as sold in the drug stores. The amount of fluid used, must have some relation to the age of the patient; from a tea-cup full, in the case of children, to a pint, or more, for adults. The water should be warmed, about 60°, and a little castile soap dissolved in it will much increase its efficacy. It must be thrown up with some degree of force, and after half an hour, if there has been no evacuation, it may be repeated.

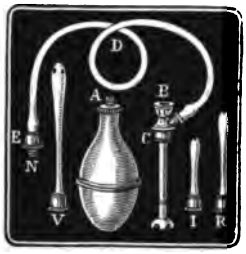


FIG. 90.

Other measures, soap repositories, cones of paper, and the like, are mentioned in all works on practice, and need not occupy our attention at this time. In closing, I will state, however, that notwithstanding injections are decidely objectionable, yet there does seem to be an occasional necessity for their employment. When the necessity for an evacuation of the bowels is imperative, and ordinary medicinal treatment fails to accomplish the purpose, the injection must always be preferred to all other means, particularly to the administration of cathartics in any form, mild or severe.

FINIS.

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CORRIGENDA.

Page 47, line 11, for "morbed" read "morbid action."
Page 60, line 13, for "pointed" read "jointed."
Page 74, line 6, for "suppuration" read "reparative."
Page 75, line 13, for "usual size" read "proper size."
Page 77, line 18, for "left" read "right."
Page 78, line 7, for "double S" read "double T."
Page 84, line 3, from bottom, for "opposite" read "same."
Page 150, line 1, for "will" read "will not."
Page 154, line 9, for "extensive" read "extension."
Page 183, line 7, for "No 6," read "No 18."
Page 184, line 4, from bottom, for "5" read "16."
Page 184, line 2, from bottom, for "8" read "18."

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